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RESEARCH-ROCHFORD PROJECT
ENVIRONMENTAL ASSESSMENT
JUNE 2004

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ENVIRONMENTAL ASSESSMENT
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1 PURPOSE AND NEED

1.1 Introduction

Land managers for the Northern Hills Ranger District of the Black Hills National Forest (BHNF) propose vegetation harvest treatments, fuels treatments, road improvements, and transportation management in the Research-Rochford Project Area. The proposals are intended to reduce susceptibility to insects and disease, reduce hazardous fuels, produce timber, sustain future timber yield, enhance vegetative diversity, reduce road densities, enhance big game habitat and meet relevant environmental standards. This Environmental Assessment (EA) is tiered to:

1) The 1997 Revised Land and Resource Management Plan ("Revised Forest Plan") for the BHNF.
2) The Final Environmental Impact Statement ("FEIS") associated with the Revised Forest Plan.
3) The EA and decision notice for the 2001 Phase I Amendment ("Phase I Amendment") to the Revised Forest Plan.

This project follows the Revised Forest Plan, as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 ("RPA," P.L. 93-378) and the National Forest Management Act of 1976("NFMA," P.L. 94-588). This EA does not reconsider the issues or analysis that led up to the Revised Forest Plan land allocations, goals, objectives, standards and guidelines. The FEIS and Revised Forest Plan are available for review at the Spearfish office of the Northern Hills Ranger District, as well as at the Forest Supervisor's Office in Custer, South Dakota.

This EA summarizes relevant information about the project. Further information about the analysis is on file at the Northern Hills Ranger District.

1.2 Original Research-Rochford and Peak Projects

This project first appeared in the November 17, 1998 issue of the Schedule of Proposed Actions as part of the original Research-Rochford and Peak projects. A draft EA for these projects was prepared and released for public comment in June 1999. Following finalization of the EA, the Supervisor of the BHNF signed separate decisions for the Research-Rochford and the Peak projects in September 1999.

In October 1999, the Reviewing Officer for the Chief of the Forest Service issued a decision on administrative appeals of the Revised Forest Plan. This decision gave further instructions concerning the issues of species viability and diversity and cast doubt on the sufficiency of documentation for the Research-Rochford and Peak projects. Therefore, the decisions were withdrawn in January 2000.

As a result of the Chief's decision, the Forest prepared and analyzed the Phase I Amendment to the Revised Forest Plan. The Regional Forester approved the amendment in June 2001. This amendment changed and added various standards and guidelines, primarily those related to species viability.

To capture the intent of the Phase I amendment, the Peak project was reanalyzed in a new EA, and the BHNF Supervisor made the decision to implement that project in January 2002.

For the Research-Rochford analysis that is discussed in this document, the original 1999 Research-Rochford project was modified to reflect the new Phase I Amendment direction, incorporate new stand data, identify new opportunities for fuels reduction and develop a new travel management strategy. Because of the differences between the original and the current Research-Rochford projects, the project has been completely reanalyzed. A scoping opportunity for the current Research-Rochford project was provided in May 2003. The record of scoping comments is in the project file, available for review at the Northern Hills District office of the BHNF in Spearfish, South Dakota.

1.3 Project Area Location

The Project Area is located in Lawrence and Pennington Counties, South Dakota, in the north-central Black Hills. Legal description is shown in Table 1.

Township	Range	Section (all or portions)
T02N	R03E	1-3, 10-15, 23-26, 35-36
T02N	R04E	1-12, 15-22, 27-33
T03N	R03E	36
T03N	R04E	3-5, 8-11, 14-16, 21-23, 26-29, 31-35
Black Hills Meridian		

Table 1. Project Location

The Project Area includes approximately 25,690 acres of National Forest System lands and 2,929 acres of private land, for a total of 28,619 acres. Portions of nine separate 7th level watersheds are located in the Research-Rochford Project Area. Proposed activities would only occur on National Forest System lands. Log hauling may occur across areas of private land on which the Forest Service has acquired rights-of-way.

Vegetation management and fuels reduction activities would occur on about 3,800 acres of National Forest system lands on the Northern Hills Ranger District. Connected actions include reconstruction, maintenance, and closure of roads within Forest Service jurisdiction. Figures 1 through 7 in Chapter 2 display the locations of the two Management Areas, private lands, vegetation and fuels treatments and road proposals within the Project Area. A vicinity map showing the Project Area is displayed inside the front cover.

1.4 Revised Forest Plan Management Areas

The Research-Rochford Project Area includes two management areas, as designated by the Revised Forest Plan (see Figure 1).

Management Area 5.1 - Resource Production Emphasis (22,295) acres)

These areas are managed for wood products, water yield and forage production, while providing other commercial products, visual quality, diversity of wildlife and a variety of other goods and services.

Management Area 5.3A – Black Hills Experimental Forest (3,395 acres)

Vegetation in the Experimental Forest is managed consistent with current or planned research projects, assuring that the integrity of these projects is protected. Experiments are designed to determine how alternative forest management programs affect forest resources.

As a result of management area direction and planned research projects, no timber harvest or fuel treatments would take place in the Experimental Forest. Transportation management changes for the area will be analyzed in this document.

Figure 1. Management Areas

1.5 Purpose and Need

The purpose of the Research-Rochford Project is to implement the Revised Forest Plan by reducing susceptibility to insects and disease, reducing hazardous fuels, producing timber, sustaining future timber yield, enhancing vegetative diversity, reducing road densities, and enhancing big game habitat. These needs are tied to Forest Service regulation, policy, and land use planning; especially the Revised Forest Plan and Phase I Amendment objectives, standards, and guidelines.

The proposals in the project respond to specific goals and objectives in the Revised Forest Plan and are based on a comparison of desired conditions and existing conditions. The following is a summary of the objectives and standards that drive the need for action. The existing situation and opportunities to respond to these objectives are also identified. Chapter 3 provides further details about how the project meets Revised Forest Plan direction.

Forest-wide Objective 103: *Maintain or improve long-term stream health. Achieve and maintain the integrity of aquatic ecosystems to provide stream-channel stability and aquatic habitats for water quality in accordance with state standards.*
Forest-wide Objective 105: *Prohibit motorized vehicle use in wetlands, wet meadows, and riparian areas, except at specified locations and times of the year.*

Motorized travel is currently occurring along Benner Gulch and Gimlet Gulch resulting in resource damage to wet meadows and riparian areas. Closure of roads in these areas would eliminate or reduce these impacts, and improve riparian conditions.

Forest-wide Objective 201*: Conserve existing hardwood communities and restore historic hardwood communities by 10% over 1995 conditions.*

Although this objective is currently being met in the Project Area, there are opportunities to restore hardwood communities that previously existed in the Project Area.

Forest-wide Objective 204: *Conserve and manage white spruce, lodgepole pine, limber pine and Douglas-fir.*

Approximately 190 acres of white spruce cover type exist in the Project Area. Spruce is also present in pine and hardwood stands as an understory or secondary component. No Douglas-fir, lodgepole pine, or limber pine stands are mapped in the analysis area as separate stands. Phase I Amendment standards and guidelines preclude vegetation management treatments in spruce stands to protect marten habitat.

Forest-wide Objective 205: *Restore grassland communities to 10% over 1995 conditions; base restoration potential on landform and soils.*

This objective is currently being met in the Project Area. Opportunities to restore previously existing grassland communities do exist in the Project Area.

Forest-wide Objective 207: *Manage at least 5% of the forested landbase for late succession. The 5 percent should include acres in Management Area 3.7, the smaller stands identified in the Resource Information System (RIS) database, and other management areas that provide late succession conditions, such as wilderness… these areas could provide important wildlife benefit.*

Forest-wide Objective 208: *Provide smaller late succession patches to meet specific resource elements.*

The Project Area does not contain Management Area 3.7. There are approximately 197 acres of late-succession forest in smaller stands and patches as referenced in Objectives 207 and 208. Late successional forest could be created as a result of silivcultural prescriptions.

Forest-wide Objective 209: *Manage at least 5 percent of a timber harvest project area for the grass/forb structural stage.*

There are currently 268 acres of grass/forb structural stage in ponderosa pine and spruce stands. This figure does not include permanent grasslands (see Objective 205 above). It also does not include old log landings, skid trails, utility corridors, or other small, scattered grass/forb openings. All of these features combined add to the total of grass/forb structural stage, and additional areas could be created during development of silvicultural prescriptions.

Forest-wide Objective 211: *In ponderosa pine forested portions of a watershed, maintain an average of 2 hard snags per acre on south-facing slopes and 4 hard snags per acre on north-facing slopes, well dispersed across the watershed through the rotation. Calculate as a per-acre average for the watershed; some acres may have no snags while others may exceed the average. In other forest types maintain an average of 6 hard snags per acre, well dispersed across the watershed.*

The Project Area was analyzed assuming that existing snag density does not meet Revised Forest Plan direction. Retention of at least 5 trees per acre, of the largest diameter class available, would provide large-diameter snags over time.

Large-diameter snags are an important habitat component for many wildlife species. There is an opportunity to increase the number of snags by creating them from live trees. Long-term availability of large snags could be increased by silvicultural treatments that would retain large-diameter trees and increase their growth rate.

Forest Wide Objective 221: *Conserve or enhance habitat for sensitive species and species of special interest (management indicator species).*

Several sensitive and management indicator species have been documented in the Project Area, and habitat exists for others. Project design features, including road closures, insect control and thinning of conifer stands could benefit sensitive and management indicator species.

Forest-wide Objective223: *Use management ignited fires and prescribed natural fires to achieve desirable vegetative diversity and fuel profiles on 8000 acres per year for the next decade. Use natural fire on a limited basis under specifically prescribed conditions.*

There is a need to reduce hazardous fuels and increase habitat diversity and an opportunity to use management ignited fires to achieve these ends.

Forest-wide Objective 224: *Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide Standard 4110.*

Hazardous fuels exist in parts of the Project Area. There is a need to reduce the fire hazard and an opportunity to do so through mechanical fuel treatments and prescribed fire.

Forest-wide Objective 228: *Within planning units where outbreaks of mountain pine beetles could threaten management objectives, maintain or reduce acreage of ponderosa pine stands that are in medium or high risk condition for infestation.*

Some pine stands are at relatively high risk of mountain pine beetle infestation, potentially threatening management objectives. Commercial and precommercial thinning from below and regeneration harvesting are needed to reduce acreage of ponderosa pine stands at risk of beetle attack and meet Objective 228.

Forest-wide Objective 303: *Offer 838 MMBF of sawtimber and 21MMCF of roundwood per decade.*

This objective applies to the entire Forest and has not yet been met for the current decade. The portion of the Research-Rochford area allocated to Management Area 5.1 is expected to contribute timber toward the Forest goal. Some previously harvested stands are now revegetated and the residual overstory is slowing the growth of the regenerated stand. Overstory removal is needed to reduce the number of trees that compete with the younger stand. Commercial and precommercial thinning from below are also needed to reduce understory density and promote tree health and vigor. These treatments would contribute to meeting current and future timber needs.

Forest-wide Standard 9101: *Forest Development Roads (FDR[1]) are open all year to appropriate motorized vehicle use, unless a documented decision shows one or more of the following: a. Motorized use conflicts with Forest Plan objectives; b. Motorized use is incompatible with the recreation opportunity spectrum class; c. Motorized use creates user conflicts that result in unsafe conditions; d. Physical characteristics of travelway(s) preclude any form of motorized use; e. Travelways do not serve an existing or identified future public need; f. Financing is not available for maintenance necessary to protect resources; g. Seasonal travel restrictions are required: (1) To avoid unsafe conditions or to prevent unacceptable damage to soil and water resources due to weather or seasonal conditions; (2) To prevent unacceptable wildlife conflict or habitat degradation; (3) To meet a seasonal public and administrative need; or (4) For area protection or non-use.*

Forest-wide Standard 9106: *Obliterate forest development roads when project decisions indicate they are no longer needed to achieve management activities, or where resource damage cannot be mitigated. Inventory and obliterate non-forest development road travelways during project planning and implementation.*

Roads were evaluated in a project-level roads analysis that identified candidates for decommissioning of roads. This evaluation is available in the analysis file located at the Northern Hills Ranger District. Habitat capability modeling indicates that the existing road network reduces habitat effectiveness for deer and elk below Revised Forest Plan direction. Road closure would increase habitat effectiveness.

[1] Forest Development Roads are also known as National Forest Service system roads (NFSRs) and classified roads.

Proposed road closures are needed to follow Forest Service policy. Forest Service Manual 7700 states that many unplanned, unauthorized, and unclassified travel ways exist within National Forest System lands and these are high priority candidates for decommissioning. The manual also states that, "...emphasis would be given to reconstructing and maintaining classified roads while decommissioning unnecessary classified and unclassified roads. It may be necessary to regulate use on some unneeded roads until decommissioning or other approved uses, such as conversion to trails, can be achieved."

Management Area Objectives 5.1-202: *Manage forest cover types to provide variety in stand sizes, shape, crown closure, age structure and interspersion.*

Treatments within mature forest stands between 100 and 140 years old (commercial thinning, shelterwood) would promote structural diversity (variety in crown closure, etc.). Phase I Amendment standards and guidelines require a range of ages, densities, and structural classes within certain habitats. The variety and structure diversity standards and guidelines can be met through silvicultural treatments.

Management Area Objectives 5.1-203: *Maintain or enhance hardwood shrub communities where biologically feasible, and within management objectives.*

There are currently 5,507 acres of low basal area forest (Structural Stages 1, 3A and 4A) in the Project Area that provide good conditions for shrub growth. Prescribed burning and reduction of high overstory basal areas would increase the area available for shrub growth.

Management Area Objective 5.1-3201: *Deer and elk habitat effectiveness (HE) values in a planning unit should at least meet [prescribed] values...Vegetative management projects in planning units currently below these values should result in increased habitat effectiveness.*

Deer and elk habitat effectiveness ratings are currently below prescribed values for deer summer and winter range, and for elk summer range in management area 5.1. System and non-system road closures are needed to increase habitat effectiveness and meet this objective.

1.6 Issues

1.6.1 Public Involvement

Public involvement in this project began in November 1998 when the original Research-Rochford and Peak projects were listed in the BHNF's Quarterly Schedule of Proposed Actions. The project has appeared in each issue of the Schedule of Proposed Actions since November 1998, with status updated as the project reached the current stage.

Scoping for the current Research-Rochford project was conducted in May 2003. Copies of public involvement documents and record of public responses are contained in the project file.

The scoping comments were utilized in issue development, alternative formulation, and document preparation. Many of the concerns expressed during scoping are addressed in the Phase I Amendment and Revised Forest Plan objectives, standards and guidelines

and inclusion of design features and mitigation measures that reduce potential for significant effects.

1.6.2 Analysis Issues

The Interdisciplinary Team (IDT) identified issues relating to the proposed action based on input from Forest Service resource specialists, other agencies, organizations, landowners, and members of the general public. The Forest Service separated the issues into two groups: relevant (or "significant", as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)) and non-relevant issues. The CEQ regulations for implementing NEPA require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review..." Relevant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-relevant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) not related to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. A list of non-relevant issues and reasons regarding their categorization as non-relevant may be found in the project record.

The Forest Service identified five relevant issues raised during scoping. These issues include:

1. Mountain Pine Beetle

There is a concern that if pine stands are not treated, mountain pine beetle infestations would increase to epidemic levels.

Indicator: Acres of pine at low, medium and high risk of beetle infestation.

2. Fuels and Prescribed Fire

There is concern that there are large concentrations of hazardous fuels on National Forest System lands adjacent to private developments within the Project Area, and some private landowners and agencies would like the Forest Service to increase activities to reduce this hazard. There is also concern that if prescribed fire is utilized to reduce the fuel load, the fire could escape and cause unanticipated damage to private lands and resources, as well as National Forest System lands and resources.

Indicator: Acres, type and location of proposed fuel treatments and proposed prescribed fire. Acres treated surrounding communities at risk and acres of wildland urban interface treated.

3. Travel Management

There is concern that closing roads would detrimentally impact use of the area for motorized recreation and increase wildfire suppression time. Other comments indicate there are too many roads in the Project Area and this detrimentally impacts wildlife habitat.

Indicator: Miles of road open, closed and decommissioned; deer and elk habitat effectiveness, condition of habitat for species affected by roads.

4. Timber Harvest

There is concern that the proposed timber harvest levels must be adequate to meet Revised Forest Plan objectives for sustained commodity production, while providing long-term forest sustainability.

Indicators: Volume of sawtimber and roundwood that would be produced, including consideration of cumulative impacts of the project.

5. Biodiversity/Wildlife Habitat

There is concern that the proposed timber harvest levels should be reduced because of potential detrimental impacts to biodiversity and wildlife habitat.

Indicators: Condition of habitat for threatened, endangered, proposed, sensitive, and management indicator species.

1.7 Decisions to be Made

The purpose of this EA is to disclose the effects and consequences of proposed actions and alternatives. Based on this analysis, the responsible official will decide:

- Whether to approve the project activities, mitigation measures, design features and monitoring associated with the Proposed Action or an alternative.
- Whether the selected alternative can be supported by a Finding of No Significant Impact.

2 THE PROPOSED ACTION AND ALTERNATIVES

Chapter 2 describes and compares three alternatives; the No Action alternative (Alternative A), and two action alternatives (Alternatives B and C). In addition, other alternatives were considered but have been eliminated from detailed study.

2.1 Alternatives Considered and Analyzed in Detail

2.1.1 No Action-Alternative A

Consideration of the No Action Alternative is a requirement of the National Environmental Policy Act. The No Action alternative is the only alternative considered that does not meet the Purpose and Need for Action. The No Action Alternative generally does not have direct effects; however, over time, lack of forest management has environmental consequences.

Under No Action, ongoing road maintenance, noxious weed management, grazing, and activities in ongoing timber sales (Minnex) would continue according to existing management plans. Treatments considered in this analysis would be deferred until some future time, although some of the proposed projects (non-classified road closures, timber stand improvement thinning) could possibly be accomplished under Categorical Exclusion authority (40 CFR 1508.4) if Alternative A were selected.

2.1.2 Proposed Action - Alternative B

Alternative B (proposed action) was developed by the IDT to implement the Revised Forest Plan by reducing susceptibility to insects and disease, reducing hazardous fuels, producing timber, sustaining future timber yield, enhancing vegetative diversity, reducing road densities, and enhancing big game habitat. The IDT reviewed the existing conditions throughout the Project Area and proposed vegetation harvest, fuels and road treatments to help reach desired conditions as identified in the Revised Forest Plan. Ongoing road maintenance, noxious weed management, grazing, and activities in ongoing timber sales would continue according to existing management plans.

The preliminary proposal utilized in the May 2003 scoping was modified based on public input and refinement of resource information by the IDT. Review of plant and heritage resource inventory information resulted in eliminating or modifying some of the proposed treatments during development of Alternative B. Numerous scoping comments expressed concern that too many roads were proposed for closure in the May 2003 preliminary proposal. Alternative B responds to this concern and identifies less road closure when compared to the other action alternative.

Vegetation Harvest Proposals

Commercial thinning/ Overstory Removal/Non-Commercial Timber Stand Improvement is proposed on 207 acres. This treatment responds to variability within each stand and is designed to retain the best trees under conditions that promote optimal growth. Much of the stand would be commercially thinned from below to remove suppressed, defective, and excess stems, while maintaining the overstory at 40 – 60 square feet per acre of basal area (BA). Undesirable trees greater than 9 inches diameter at breast height

(DBH) could be offered for sale. Where an established understory exists (minimum 300 stems/acre and 1 foot tall), the overstory would be removed to allow the understory to develop. Basal areas would range from 0 to 20 square feet per acre in the overstory. In overstory removal treatments, retention of at least 5 trees per acre, of the largest diameter class available, would provide large-diameter snags over time. This is an intermediate treatment of a stand managed under the shelterwood system. The objective of the non-commercial timber stand improvement is to remove defective and excess trees within the 1 inch to 9 inch DBH range and retain the best stock at desired densities.

Overstory Removal/Non-commercial Timber Stand Improvement is proposed on 1,358 acres to improve growth in well-established seedling/sapling stands. Large trees would be removed to allow the new stand to make full use of the site. In overstory removal treatments, retention of at least 5 trees per acre, of the largest diameter class available, would provide large-diameter snags over time. This would be the final harvest of the original stand and an improvement cut for the new stand. The objective of the non-commercial timber stand improvement is to remove defective and excess trees within the 1 inch to 9 inch DBH range and retain the best trees at desired densities.

Commercial Thinning/Non-Commercial Timber Stand Improvement is proposed on 648 acres to retain the best growing stock under conditions that promote optimal growth. This involves thinning from below to remove undesirable, suppressed, defective, and excess stems. Trees greater than 9 inches DBH may be sold. If supported by the pulp and pole market, trees in the 5 inch to 9 inch DBH range may also be sold. The remaining BA would include all stems and range from 40 to 80 square feet per acre. This would be an intermediate treatment of a stand managed under the shelterwood system. Approximately 106 acres of the treatment area would include follow-up prescribed burning.

Non-Commercial Timber Stand Improvement is proposed on 442 acres. Suppressed, defective and excess trees are removed to retain the best trees at a desired density. This treatment would treat trees with a 1 inch to 9 inch DBH stem diameter and is being planned as non-commercial. If supported by the pulp and pole market, the trees could be sold.

Meadow Restoration is proposed for 93 acres. This treatment is designed to reestablish historic meadow conditions on previously existing meadow areas that have been encroached upon by conifer species. The prescription is designed to remove conifer tree species, including removal of the understory by prescribed fire.

Hardwood Restoration would take place on 79 acres. This treatment is designed to encourage hardwood occupancy of the site. All conifer trees would be removed, followed by prescribed burning to reduce fuels, reintroduce fire into the ecosystem, and increase browse, forage and hardwood regeneration. The site would be expected to shift to hardwood species.

Sanitation would take place on up to 250 acres as necessary to respond to localized mountain pine beetle infestation or windthrown events. Cutting of beetle-infested trees would take place in patches up to five acres in size. Area treated would not exceed 1% of the project area or 7% of the older, dense forest. Harvest would take place in areas accessible from existing roads and would comply with design criteria and mitigation

listed in Section 2.1.5. Any sanitation harvest proposals would be reviewed on the ground by resource specialists before implementation.

All treatments are displayed in Figure 2, Proposed Action Vegetation Harvest Treatments. Total volume produced would be approximately 8 MMBF of sawtimber and 192 CCF of roundwood.

Figure 2. Proposed Action Silviculture Treatment Areas

Fuel Treatments Proposals

Fuel treatments identified in the above vegetation harvest areas are proposed as part of the silvicultural prescription to meet Revised Forest Plan direction. Objectives include reducing natural and activity fuels, stimulating sprouting of hardwoods, and preparing sites for natural regeneration. In addition, there are several fuel treatments proposed outside of the vegetation harvest areas.

The fuel treatments are designed primarily to reduce fuels in areas where humans and their developments meet or intermix with wildland fuels (Wildland Urban Interface or WUI) or in areas near communities that are in the vicinity of federal lands that are at high risk of wildfire (Communities At Risk or CARs). There are approximately 2,130 acres of WUI in the Project Area. The specific areas are identified in the project file. The town of Rochford has been designated as a CAR (USDA 2001c). Alternative B would treat fuels on approximately 285 acres designated as WUI and treat approximately 17 acres of fuels surrounding the town of Rochford.

Jackpot Burning is proposed for 72 acres to reduce concentrations of fuels. The treatment would not be associated with timber harvesting, but instead would concentrate on areas with high accumulations of fuels. Fuel breaks would not be constructed, as containment would use natural fuel breaks, roads and snow cover for control. The scattered heat associated with these burns should not harm trees greater than 3 inch DBH, but would destroy most seedlings.

Prescribed Burning is proposed for 401 acres to reduce fuel loadings, stimulate browse, reduce stand density and reintroduce fire into the ecosystem. Cool under-burns would be used, allowing no more than 10% mortality in the overstory and up to 50% mortality in trees less than 9 inches DBH. Of the 401 acres, 106 acres would be in proposed commercial thinning/non-commercial timber stand improvement treatments, 93 acres would be in meadow restoration treatments, and 79 acres would be in hardwood restoration treatments. The remainder of the prescribed burning (123 acres) would be outside of proposed vegetation harvest treatments.

Manual Fuels Reduction is proposed for 53 acres to establish a low fuel loading zone adjacent to roadways and private land. Trees less than 9 inches DBH would be treated. Leave tree spacing would be on 20 foot by 20 foot intervals or less. Residual trees would reflect the range of tree diameters currently on the site and emphasize the larger, better developed trees. Manual methods, including piling and burning, would be used to treat the existing and generated fuels.

Mechanical Fuels Reduction is proposed for 500 acres to reduce fuel loads within stands. This treatment would be very similar to the manual fuels reduction treatment, but would utilize mechanical methods (chipping, mulching, etc.) to treat the existing and generated fuels.

Fuelbreaks are proposed for 192 acres to establish a low fuel-loading zone adjacent to roadways and private land. Trees less than 9 inches DBH would be treated. Leave trees would be spaced at up to 20 by 20 feet. Residual trees would reflect the range of tree diameters currently on the site and emphasize the larger, better developed trees.

Mechanical methods (chipping, mulching, etc.) would be used to treat the existing and generated fuels.

All proposed fuels treatments are displayed in Figure 3, Proposed Action Fuels Treatments.

Figure 3. Proposed Action Fuels Treatment Areas

Road Proposals

Alternative B road proposals were developed from a project-level roads analysis and include road construction, reconstruction, and maintenance activities necessary to access vegetation harvest treatments identified with the alternative. Alternative B also includes closing roads that are currently open year-long or seasonally. In addition, most unclassified roads would be closed in accordance with Forest Service roads management policies (FSM 7700). These unclassified roads were not built or sanctioned by the Forest Service, have not been maintained by the Forest Service, and are not needed for access for management of the area. The option of not closing any roads was not considered, because that would not meet the goals and objectives of the Revised Forest Plan or the wildlife objectives identified in the Purpose and Need.

Road Improvements

Proposed road improvements would facilitate vegetation management treatments. Approximately 2.9 miles of new road construction would be required. In addition, approximately 21.3 miles of road reconstruction and 29.0 miles of pre-use maintenance would be needed on existing classified roads.

Several Best Management Practices are associated with road improvements. These are described in the transportation plan in the analysis file, located at the Northern Hills Ranger District.

Transportation Management

Approximately 3.7 miles of existing classified roads that are currently open yearlong would be closed yearlong with gates or other physical closures. Approximately 6.5 miles of existing classified roads that are currently open seasonally would be closed yearlong. Information on the procedure that would be used to close each specific road is available in the project file.

In addition to the above, several roads would be decommissioned. This includes approximately 3.7 miles of existing classified roads, and approximately 26.9 miles of existing non-classified roads.

Proposed Action road proposals are illustrated in Figure 4.

Figure 4. Proposed Action Road Proposals

2.1.3 Alternative C

Alternative C was developed to provide an alternative that emphasizes biodiversity and wildlife values. Less vegetation harvest and fewer fuel treatments would be completed in structural stages 3A (saplings/poles with less than 40 percent canopy cover), 3C (saplings/poles with canopy cover greater than 70 percent) and 4C (mature trees with greater than 70 percent canopy cover) to provide a better balance of structural stage diversity. Some proposed silvicultural treatments involving new road construction would not take place, and more roads would be closed to vehicular traffic. Less road construction and more road closures would increase wildlife habitat effectiveness. Similar to other analyzed alternatives, ongoing road maintenance, noxious weed management, grazing, and activities in ongoing timber sales would continue according to existing management plans. This alternative would produce approximately 7.3 MMBF of sawtimber and approximately 118 CCF of roundwood.

The prescriptions identified for the various vegetation harvest treatments and fuels treatments would be the same as described under Alternative B, but acreages would change. In addition, the mileages of road improvements and transportation management would change.

Alternative B would treat fuels on approximately 246 acres designated as WUI and treat approximately 17 acres of fuels surrounding the town of Rochford. These acres are included within the acres identified in Table 2.

The acres and miles associated with Alternative C are reflected in the following table. The silviculture harvest treatments, fuels treatments, and road proposals are reflected in Figures 5, 6, and 7.

Alternative Components	
Acres Commercial Thinning/Overstory Removal/Non-commercial Timber Stand Improvement	166
Acres Overstory Removal/Non-Commercial Timber Stand Improvement	1,330
Acres Commercial Thinning/Non-commercial Timber Stand Improvement (106 acres include follow up prescribed burning)	405
Acres Non-commercial Timber Stand Improvement	348
Acres Meadow Restoration (includes follow up prescribed burning)	93
Acres Hardwood Restoration (includes follow up prescribed burning)	40
Acres of Sanitation	250
Acres of Jackpot Burning	72
Acres of Prescribed Burning**	388
Acres of Manual Fuels Reduction	53
Acres of Mechanical Fuels Reduction	500
Acres of Fuelbreaks	134
Miles of Road Construction	0
Miles of Road Reconstruction	21.7
Miles of Road Maintenance	26.7
Miles of Existing Classified Road Currently Open Yearlong That Would Be Closed Yearlong	16.6
Miles of Existing Classified Road Currently Open Seasonally That Would Be Closed Yearlong	22.9
Miles of Existing Classified Road That Would Be Decommissioned	3.7
Miles of Existing Non-classified Road That Would Be Decommissioned	26.9

*** This includes 106 acres of follow up prescribed burning in Commercial Thinning/Non-commercial Timber Stand Improvement treatments, 93 acres in meadow restoration treatments, and 40 acres in hardwood restoration treatments.*

Table 2. Actions Associated With Alternative C

Figure 5. Alternative C Silviculture Treatment Areas

Figure 6. Alternative C Fuels Treatment Areas

Figure 7. Alternative C Road Proposals

2.1.4 Treatment Timing

The National Forest Management Act ((NFMA), 16 U.S.C. 1604 (m)) generally prohibits the harvest of stands before they reach their maximum growth rate. Exceptions in the law allow the harvest of individual trees, or even parts of whole stands of trees, before this time to thin and improve timber stands and salvage damaged stands of trees (part m1 of the law). Further exceptions are allowed in order to achieve multiple-use objectives including, but not limited to, recreation, wildlife habitat, and range.

Both action alternatives propose harvest treatments that are consistent with the exceptions provided in the law, and include the following: meadow restoration, hardwood restoration, commercial thinning, overstory removal, non-commercial timber stand improvement, sanitation, and fuels treatments. No stands are scheduled for regeneration harvest under either action alternative.

2.1.5 Mitigation Measures - Action Alternatives

The following design features and mitigation measures would prevent or reduce the duration, intensity, or extent of potential adverse impacts and assure that Revised Forest Plan direction is met. A detailed review of project effects in relation to Revised Forest Plan standards and guidelines is in Chapter 3.

Forest Vegetation

- Whole-tree yarding would be the preferred method of slash treatment for all harvest activities, except overstory removal treatments. If whole-tree yarding is used in overstory removal treatments, measures must be identified to protect the residual regeneration. This could include having the sale administrator designate all skid trails and directional felling of trees to skidding corridors.
- In overstory removal treatments adjacent to private property, whole-tree yarding would be used where feasible within 500 feet of the private property boundary to remove fuel loadings. Lop-and-scatter fuel treatment would be acceptable on individual stands that would meet the desired fuel loading objectives.
- Pine regeneration would generally be protected during harvest activities except where forage production or non-pine species is the objective of harvest (hardwood and meadow restoration treatments).
- The minimum number of leave trees in any prescription is 5 per acre, except in meadow restoration or hardwood restoration treatments, where all conifer trees may be removed.
- To provide for large snags in the future, in overstory removal treatments the leave trees would be 5 large trees per acre over the stand. Retention of at least 5 trees per acre would provide large-diameter snags over time. Replacement trees would be representative of the largest diameter class available, would be left in clumps (higher priority to leave in clumps as opposed to the 5 largest), grouped with existing snags, away from open roads, and in areas where snags are least likely to be safety hazards.

- Sufficient down woody debris would be retained in ponderosa pine treatment areas to meet Revised Forest Plan standard 2308. Natural downfall would be expected to meet this requirement.

Fuel Treatments

- In precommercial timber stand improvement treatments, mechanical treatment of fuels would be used if possible. Where thinning is conducted by hand within 500 feet of private property, all slash would be hand piled.
- Where burning is used in association with non-commercial and commercial thinning vegetation treatments, tree mortality levels would be reduced by using site-specific low-intensity fire prescriptions.

Wildlife and Plants

- Two Forest Service Region 2 sensitive plant species are known to exist in the Project Area, and habitat for an additional eight Region 2 sensitive plant species occurs in the Project Area. Known populations of these plant species, and habitat where the species have high potential to occur, would be avoided during all proposed activities. Specific locations are listed in the project file and would be included in the Project Implementation Guide. A botanist would be consulted prior to placement of roads, skid trails, and other ground-disturbing activities in these areas.
- If it becomes necessary to conduct any ground-disturbing activities (e.g., log landing or skidding) outside of identified treatment units, a botanist would be consulted prior to implementation of the activity.
- RIS sites 0824030043 and 0819030065 are proposed for vegetative harvest and/or fuel reduction treatments. In addition, new road construction # 205, proposed under Alternative B, bisects RIS site 0824030043. To avoid affecting sensitive plants, a botanist would be consulted prior to any ground-disturbing activities or fuel treatments in these areas.
- Treatments proposed for RIS site 0820050015 would leave at least 40% canopy cover for protection of marten connectivity habitat.
- To protect the bat habitat associated with the A-frame Mine, treatments proposed in RIS site 0824020046 would avoid the area within 150 feet of the mine entrance.
- Existing snags would be retained unless they pose safety hazards to workers or the public.
- Under Alternative B, a harvest unit (RIS site 0824350026) is located approximately 350 meters southwest of the *Vertigo arthuri* snail colony in the project area. In addition, reconstruction of NSFR road 184.1A would start approximately 500 meters west of the snail colony. To ensure the colony is not affected during road reconstruction or timber harvest operations, the colony would be flagged with a 150-foot buffer to protect the site from inadvertent disturbance. This harvest unit and road reconstruction would not occur under Alternative C and this mitigation would not be required.

Soils and Water

- Mandatory management requirements found in the Watershed Conservation Practices Handbook (WCP) (USDA, 1999), State of South Dakota Best Management Practices (BMPs), and Revised Forest Plan standards and guidelines would be applied to proposed activities as needed for protection of soil and water.
- Many proposed activities would take place on soils identified by the Lawrence and Pennington County Soil Surveys as having a high erosion risk. Therefore, the following special provisions, intended to minimize the amount of exposed bare soil, offsite transport, and soil displacement, would apply: (1) Heavy equipment shall avoid streams and swales, except to cross at designated points, build crossings, or do restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil, (2) Stabilize and maintain disturbed areas such as temporary roads, skid trails, and landings, during and following construction and harvest operations to ensure that erosion control measures (such as water bars) are installed where appropriate, and functioning properly, (3) Utilize harvesting and skidding methods that minimize the amount of soil displaced into piles or windrows, so as to leave soil intact and in place, and (4) Conduct prescribed burns when soil, duff, and large fuels are moist, in order to prevent detrimental soil heating.
- Operations in portions of certain units should be restricted during wet conditions or conditions under which detrimental soil impacts are likely to occur. These units are identified in the project file. This measure is to prevent detrimental compaction and displacement of soils in this area.
- In order to meet Revised Forest Plan standard 1112 and WCP standard 1(a), new road construction #209 proposed under Alternative B would not be constructed without also removing the connected disturbed areas in Bloody Gulch and Benner Gulch. The amount of area disconnected must be larger than the amount of area added by construction of road #209. Disturbed areas along NFSRs 184.1A and 231.2A and unclassified road RC 2X must be disconnected from downstream receiving waters so that accelerated runoff and sediment are not added to Rapid Creek. Specific requirements are identified in the project file. This road would not be constructed under Alternative C and this mitigation would not apply to that alternative.
- In the meadow units along South Boxelder Creek (RIS sites 0819030051 and 0819030065), prohibit log landing, decking areas and mechanical slash piling within riparian areas unless the integrity of the riparian area can be protected (e.g., frozen, snow-covered ground conditions).

Rangeland Resources

- Locate roads, landings, and slash piles out of meadows and draw bottoms whenever possible to reduce forage loss and protect key grazing areas.
- Keep all pasture gates closed during the grazing season (June through October), and protect fences during logging operations to maintain proper grazing and prevent unauthorized livestock use.
- Protect and maintain range improvements such as cattle guards, fences, spring development and water storage tanks for the duration of the proposed activities.

These improvements would be identified on the sale area maps. Repair or replace any damage to range improvements resulting from implementation of project activities as appropriate. Timber sale purchasers are responsible for maintaining cattle guards put in place to facilitate timber sales for the duration of the timber sale contract period.

Noxious Weeds

- Guidelines to prevent the spread of noxious weeds for prescribed fire, road maintenance/rehab, and timber harvest activities are identified in the BHNF Weed Management Plan (approved January 18, 2003), and would be included in all contracts and permits issued as part of this project.
- Where the risk of spreading noxious weeds is high, wash off-road equipment before leaving the site to prevent spread of weeds to adjacent National Forest System and private lands. Known high risk areas would be identified by District staff prior to project implementation and included on the sale area maps.

Recreation, Scenery, and Heritage Resource Management

- Skidding logs on or across the Mickelson Trail would not be permitted. The trail would not be used for log haul. Log trucks would be permitted to cross the trail on haul roads. Any damage to the trail would be repaired and the trail restored to its original condition.
- Appropriate signing or other cautionary measures would be implemented in conjunction with all management activities to protect public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., prescribed fire manager).
- Vegetation harvest treatments located on steep terrain would be designed to blend into adjoining stands and avoid creating geometric patterns on the landscape. All units would be laid out to minimize sharp contrasts between treated and untreated vegetation. Protect natural elements such as rock outcrops, shrubs, meadows and forbs in the immediate foreground for visual diversity. Remove pine and other species invading hardwood stands to reduce competition with the aspen. Specific units are identified in the project file.
- The Forest Landscape Architect will participate in layout of all overstory removal treatments located in medium and high scenic integrity objective classes to ensure existing scenic integrity objectives are maintained. The specific units are identified in the project file.
- Within 300 feet of primary travel corridors (U.S. Highway 385, NFSR 17, NFSR 231 and the Mickelson trail), the following measures would be utilized to minimize visual impact:
    - Whole-tree yarding would be utilized where possible. If possible, whole-tree yarding would also be utilized within 500 feet of private property with developments.
    - Mark timber and cutting unit boundaries so they are not visible from the road.
    - Remove at least 70 percent of the slash within 1 year of harvest completion.

  - Where possible, slash piles, skid trails, and landings would not be located within 300 feet of the above-referenced roads or developed private property.
  - To reduce or eliminate soil color contrast from skidding, where possible, limit skidding to dry or frozen conditions. Obliterate and return skid trails to near natural conditions where they are visible from major roads.
- Several sensitive heritage resource properties are known to exist in the Project Area. No timber harvest activity or fuel treatments would be allowed within the boundaries of these sites or a surrounding buffer area. Specific buffer dimensions are identified in the project file. Any cultural artifacts found during implementation would be reported to the district archeologist and adequately protected. Heritage site locations are not listed in this EA to protect site integrity.

2.1.6 Monitoring Common to All Action Alternatives

A district interdisciplinary team would monitor implementation of any selected action alternative. At least one interdisciplinary team meeting/field review would occur prior to the advertisement of any commercial timber sale to ensure that the objectives in this EA are carried through the layout phase of the timber sale. The Project Area would be monitored by the interdisciplinary team during and following project implementation to ensure that objectives are met, mitigation measures are followed, and the measures are effective. The final monitoring review would be conducted two years after a timber sale is closed. All interdisciplinary team field reviews would be documented and a final monitoring report completed after project implementation.

Some of the project implementation monitoring would be completed by the timber sale administrator or other contract administrators. Other resource specialists would be involved in monitoring of specific mitigation measures relating to their particular resource area. Appendix A, the Monitoring Plan, includes details on what would be monitored, timing and frequency, purpose, and responsible party.

2.2 Consistency with Revised Forest Plan and Phase I Amendment

The Revised Forest Plan and Phase I Amendment contain direction in the form of forest-wide and management area goals, objectives, standards, and guidelines. Standards are limitations on management activities. Deviation from a standard requires a forest plan amendment. A guideline is a preferred course of action, and deviation is permissible if the responsible official documents the reasons for the deviation. Under the Phase I Amendment, certain guidelines are to be treated as standards (USDA, 1999). Goals are broad, general statements of desired end results of management, and objectives describe measurable desired results to work towards achieving goals.

This project is within the scope of the Revised Forest Plan analysis, and contains no unusual or extraordinary features or circumstances. A full accounting of project compliance with Revised Forest Plan and Phase I Amendment direction is located in the project file. All action alternatives considered in detail meet Revised Forest Plan and Phase I Amendment direction.

2.3 Alternatives Considered but Eliminated from Detailed Study

The preliminary proposal utilized in the May 2003 scoping was modified based on public input and refinement of resource information by the IDT. Review of plant and heritage resource inventory information resulted in eliminating or modifying some of the proposed treatments during development of the Proposed Action. The objectives of the treatments identified in the Proposed Action remained the same as the preliminary scoping proposal.

Alternative C was developed to respond to biodiversity and wildlife concerns. It differs from the Proposed Action by identifying less vegetation harvest and fuel treatment in structural stages 3A, 3C and 4C because these stages are currently underrepresented. In addition, more roads would be closed to vehicular traffic, and some treatment units requiring new road construction were dropped.

The IDT also considered other alternatives to the Proposed Action. Following are brief descriptions of alternatives not considered in detail and reasons for eliminating them from detailed analysis.

No commercial timber output.
A comment was received suggesting that an alternative be developed that only decommissioned roads and included no timber harvesting or other vegetative treatment. This alternative would not follow the direction of the Revised Forest Plan or the goals and objectives for Management Area 5.1, and would not meet the purpose and need identified for the project. Consequently, the Responsible Official decided to not consider an alternative without timber harvesting or vegetative treatment.

Emphasize the removal of smaller trees.
A comment was received suggesting that (1) No harvest or thinning be conducted in structural stages 4C or 4B, (2) No overstory be removed, and (3) No trees greater than 10" be harvested. Alternative C responds partially to this suggestion, but wholesale application of all these parameters would not follow the direction of the Revised Forest Plan or the goals and objectives for Management Area 5.1, and would not meet the purpose and need identified for the project. Convincing rationale to consider these changes was not provided. Consequently, the Responsible Official decided to not consider an alternative emphasizing only small tree harvest.

Change management area designations.
A comment was received suggesting changing all of Management Area 5.1 to 4.1 (Limited Motorized Use and Forest Products Emphasis). The same comment suggested designating all of structural stage 4C (Mature trees with greater than 70 percent canopy cover) as Management Area 3.7 (Late Successional Forest Landscapes). Management Area allocation was determined during Forest Plan revision. In the absence of a clear reason for a change of this magnitude, the decision maker elected not to fully analyze this alternative.

Emphasize wildlife concerns.
A comment was received suggesting several alternatives for consideration, including (1) an alternative that considers treating previously treated sites again as "wildlife habitat

maintenance" treatments (2) an alternative that addresses issues of forest restoration, increasing open spaces, implementation for riparian health and water quality (3) an alternative that targets "...smaller ages classes", and (4) "...provide an alternative that truly strives for an improvement of a mosaic of forage and cover for wildlife, landscape considerations for plants and species, and enhancement of meadows and restoration of hardwoods of varying age classes".

The IDT did not develop specific alternatives addressing these concerns, because there was insufficient data provided in the comment to determine specific treatments or treatment locations. The IDT feels, however, that the philosophy expressed in the comment was incorporated into the action alternatives, particularly Alternative C. During field reviews by the IDT, all previously treated areas requiring reentry were considered in development of the action alternatives. As reflected in Chapter 1, the project considered Revised Forest Plan goals and objectives related to forest health, riparian resources, water quality, wildlife habitat, and sensitive plant habitat. Opportunities for meadow enhancement and hardwood restoration were also explored. Without more descriptive site-specific recommendations, the Responsible Official felt the concerns are adequately addressed by Alternatives B and C and decided to not develop specific alternatives for these concerns.

2.4 Alternatives Compared

Table 3 compares activities proposed under each alternative. All figures are approximate. Treatment definitions and descriptions are included in Chapter 2.

Alternative Components	No Action Alternative A	Proposed Action Alternative B	Alternative C
Acres Commercial Thinning/Overstory Removal/Non-commercial Timber Stand Improvement	0	207	166
Acres Overstory Removal/Non-Commercial Timber Stand Improvement	0	1,358	1,330
Acres Commercial Thinning/Non-commercial Timber Stand Improvement (106 acres would include follow-up prescribed burning)	0	648	405
Acres Non-commercial Timber Stand Improvement	0	442	348
Acres Meadow Restoration(includes follow up prescribed burning)	0	93	93
Acres Hardwood Restoration (includes follow up prescribed burning)	0	79	40
Acres of Sanitation	0	250	250
Volume Of Commercial Timber (mmbf)	0	8.0	7.3
Volume Of Round Wood (ccf)	0	192	118
Acres of Jackpot Burning	0	72	72
Acres of Prescribed Burning**	0	401	388
Acres of Manual Fuels Reduction	0	53	53
Acres of Mechanical Fuels Reduction	0	500	500
Acres of Fuelbreaks	0	192	134
Miles of Road Construction	0	2.9	0
Miles of Road Reconstruction	0	21.3	21.7
Miles of Road Maintenance	0	29.0	26.7
Miles of Existing Classified Road Currently Open Yearlong That Would Be Closed Yearlong	0	3.7	16.6
Miles of Existing Classified Road Currently Open Seasonally That Would Be Closed Yearlong	0	6.5	22.9
Miles of Existing Classified Road That Would Be Decommissioned	0	3.7	3.7
Miles of Existing Non-classified Road That Would Be Decommissioned	0	26.9	26.9

** *This includes acres associated with follow up prescribed burning in commercial thinning/non-commercial timber stand improvement, meadow restoration, and hardwood restoration treatments. See the discussion of each alternative for specifics.*

Table 3. Comparison of Alternatives

The following table (Table 4) discusses how each alternative responds to the issues. All figures are approximate.

	No Action (Alt. A)	Proposed Action (Alt. B)	Alternative C
Issue 1: Mountain Pine Beetle			
Acres of Pine at Risk of Beetle Infestation	Low 7,498 Medium 7,830 High 5,469	Low 8,782 Medium 7,341 High 4,675	Low 8,750 Medium 7,118 High 4,929
Acres of Commercial Thinning and Non-commercial Timber Stand Improvement	0	2655	2249
Issue 2: Fuel Treatment Acres			
Jackpot Burning	0	72	72
Prescribed Burning**	0	401	388
Manual Fuels Reduction	0	53	53
Mechanical Fuels Reduction	0	500	500
Mechanical Fuelbreaks	0	192	134
Wildland Urban Interface	0	285	246
Areas Treated Near Communities At Risk	0	17	17
Issue 3:Travel Management (approximate mileages)			
Miles of Existing Road Open Year-long	114.5	93.0	80.1
Miles of Existing Road Open Seasonally	28.7	20.4	4.0
Miles of Existing Road Closed Yearlong	22.3	21.5	50.8
Miles of Existing Road Decommissioned	0	30.6	30.6
Issue 4. Timber Harvest			
Potential Sale Volume	N/A	8.0 MMBF Sawtimber 192 CCF Roundwood	7.3 MMBF Sawtimber 118 CCF Roundwood
Percent of Project Area Identified for harvest	N/A	10%	8%
Issue 5. Biodiversity/Wildlife Habitat			
Threatened and Endangered Species (Bald Eagle)	No Effect	No Effect	No Effect
Sensitive Species	N/A	May adversely impact some individuals, but is not likely to result in federal listing.	May adversely impact some individuals, but is not likely to result in federal listing.
Management Indicator Species	N/A	Species-dependent, refer to Section 3.3.1.	Species-dependent, refer to Section 3.3.1.

*** Some prescribed burning fuels treatments overlap harvest treatments as explained under the discussion of each alternative.*

Table 4. Comparison of Response of the Alternatives to the Issues

The following section compares how the alternatives would address the relevant issues. Issues are described in detail in Section 1.6.

1. Mountain Pine Beetle

Alternative A would not reduce stand susceptibility to mountain pine beetle and other insects. Alternatives B and C would reduce risk in treated stands or through sanitation treatment.

2. Fuels and Prescribed Fire

Alternative A would not involve prescribed burning, and would address the concern of the high risk to public and private resources associated with prescribed burning. Alternative A would not address the need to reduce high fuel loading in the Project Area. The incorporation of mechanical forms of fuels reduction into Alternatives B and C also addresses the concern of the risk to public and private resources associated with prescribed burning. Alternatives B and C would reduce fuel loading using both mechanical methods and prescribed fire, address the concern of high fuel loading in the Project Area, and reduce the potential of a stand-replacing wildfire.

3. Travel Management

Alternative A would maintain current travel management. Alternative B would close fewer roads than would Alternative C, and addresses the concern that the project originally identified too many road closures. Alternative C addresses the concern that the existing road network needs to be reduced to enhance wildlife habitat and increase habitat effectiveness.

4. Timber Harvest

Alternative A would not produce any wood products at this time. Alternatives B and C would provide varying amounts of wood products and fiber, and increase growth in treated stands.

4. Biodiversity/Wildlife Habitat

Alternative A would not disturb existing wildlife and rare plant habitat. All dense forest habitat would remain, and the susceptibility of these stands to stagnation, pathogens, and fire would increase over time. Under Alternatives B and C, some existing wildlife habitat would be disturbed; extensive vegetation mortality would be less likely in treated stands, while growth of residual trees in these stands would increase. Both of the action alternatives would retain 5 trees per acre in the overstory removal treatments, but would harvest many smaller trees. Alternative C would increase habitat effectiveness for deer and elk more than Alternative B, primarily because of the increase in road closures. Both action alternatives would meet Revised Forest Plan objectives and be an improvement over the existing condition.

3 ENVIRONMENTAL CONSEQUENCES

This section describes the scientific and analytical basis for the alternative comparison shown in Chapter 2 of this EA. Chapter 3 of the FEIS discusses short- and long-term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects that cannot be avoided when implementing management actions in the Black Hills forest environment. This EA is tiered to the FEIS; effects that are described in the FEIS are not necessarily repeated here. This EA focuses on analysis demonstrating how the project complies with the Revised Forest Plan and the Phase I Amendment. Site-specific direct, indirect, and cumulative effects are also disclosed.

The Research-Rochford Project Area includes 25,690 acres of National Forest System land and is further described in Chapter 1. Direct and indirect effects analyses were conducted on the Project Area only.

For the majority of the resources analyzed for the project, the cumulative effects analysis area is the portions of nine 7th-level watersheds that are located within the Project Area, as illustrated in Figure 8. This area includes 25,690 acres of National Forest System lands and 2,929 acres of land in other ownerships. If analysis of a particular resource discipline dictates a different cumulative effects area, that area is defined in the cumulative effects discussion for the involved resource. Cumulative effects analysis includes immediate effects and those that may occur within five to twenty years.

Past actions. Black Hills forests have been subject to modification from their essentially untouched pre-settlement state since the 1870s. Forest vegetation has been altered by humans through timber harvest, fire suppression, introduction of exotic species, wildfires, insects and disease, and grazing by domestic livestock. As a result, more of the landscape is forested, though the trees are generally smaller (Parrish et al. 1996, USDA 1996 p. III-136).

The Merritt, Unction and Bolt timber sales have occurred within the cumulative impacts area since 1991. During this same timeframe, the Estes timber sale occurred outside but near the area. The Merritt sale involved lands located both inside and outside the Project Area. The Bolt sale was within the Experimental Forest (Management Area 5.3A). Various forest research projects have occurred in the Experimental Forest.

Current actions. The Minnex timber sale is currently under way in the cumulative effects analysis area and the Roubaix, Hanna, Greenant and Dano sales are ongoing immediately outside the project area. Public Law 107-206 was signed on August 2, 2002, and allowed the USFS to treat the area immediately north of the project area to reduce beetle infestation and fire hazard. None of the specific treatments areas are adjacent to the project area.

Other ongoing activities include firewood cutting of down trees or harvest piles, livestock grazing, mining activity, subdivision development, road and utility construction/maintenance, fuels management, fire suppression, mountain pine beetle treatment, water diversions for livestock, and continuing work in the Experimental Forest. The principal recreation uses include snowmobiling, hiking, hunting, all terrain vehicle/motorcycle use of trails and roads, and recreational driving. The Mickelson Trail bisects the area and is utilized for various non-motorized recreational pursuits.

Despite the presence of a number of mining claims, there are no active hard-rock mining operations in the Project Area. Limited placer mining activity occurs in Rapid Creek. Other mining activity in the Project Area includes the Forest Service Benchmark Gravel Pit.

Future actions. Reasonably foreseeable future actions include a continuation of the activities identified under current actions. The pending Mercedes timber sale on Mystic Ranger District and the pending Jimmy and Strike timber sales on the Northern Hills Ranger District are located in close proximity to the cumulative impacts area.

Figure 8.Cumulative Effect Analysis Area - 7th Level Watersheds

3.1 Forest Vegetation

3.1.1 Indirect and Direct Effects on Vegetation

This section summarizes the silviculturist's report (located in the project file), which contains data, research references and detailed analysis of effects on the timber resource. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Plan direction.

Timber Production

Alternative A would not harvest any timber volume. Alternative B would produce approximately 8.0 MMBF of sawtimber and 192 CCF of roundwood on approximately 2,827 acres of National Forest System lands. Alternative C would produce approximately 7.3 MMBF of sawtimber and 118 CCF of roundwood on approximately 2,382 acres of National Forest System lands. Any timber harvest treatment area could be susceptible to wind damage, lack of cone production or germination requirements, and/or damage to residual trees. The proposed treatments would follow Revised Forest Plan standard 2408 for acceptable silvicultural practices to reduce the potential for undesirable results.

Chapter 2 displays harvest treatments by alternative and discusses treatment descriptions.

None of the alternatives would affect long-term pine sawtimber productivity.

Forest Stand Diversity

Management Area 5.1 has a diversity objective (5.1-202). Management Area 5.3A does not have a diversity objective, but there are no treatments proposed in the Area, and this discussion is limited to Area 5.1

Under Alternative A, no treatments are proposed that would affect stand diversity. Stand diversity would depend on natural succession and disturbances such as wildfire and insect infestation. Absent any disturbances, age class distribution would move toward mature stages and away from younger stages.

Under both action alternatives, the silviculture treatments vary in size from 4 to 237 acres and were designed to create variety across the landscape. The varying size of these treatments provides diversity of stand size and shape.

By moving some stands from mature to younger age classes, the treatments identified in Alternatives B and C would improve the variety of ponderosa pine age class distribution within the Project Area as identified in Revised Forest Plan 5.1-502. Alternative B includes 1,565 acres of overstory removal treatments that would result in younger age classes. Alternative C involves 1,496 acres of overstory removal treatments that would result in younger age classes. The acreage of mature age classes would also decrease with both alternatives and increase the acreage of seedlings, saplings, and temporary grass and forb areas.

Insects and Disease

Revised Forest Plan objective 228 directs maintenance or reduction of ponderosa pine acres at medium or high risk for mountain pine beetle infestation. A 2001 aerial survey of the area indicated epidemic populations are building (Allen 2003). Risk can be reduced by decreasing stand density or by lowering average tree diameter below 7 inches DBH. Reduction of stand density would also reduce *Armellaria* root fungus occurrence and spread.

There are currently 13,299 acres of forest at medium or high risk of mountain pine beetle infestation in the Project Area (see Table 5). Alternative A would not have an immediate effect on mountain pine beetle infestation and would not move toward meeting the Revised Forest Plan objective. Alternative B would treat 2,400 acres and Alternative C would treat 2,066 acres that are in medium or high risk condition. Following treatment the action alternatives would move toward the objective by immediately reducing high and moderate risk to the levels reflected in Table 5. The treatments would reduce stand density or average stand diameter and reduce the risk of a mountain pine beetle epidemic across the Project Area.

Both action alternatives leave over 4,500 acres at high risk of insect infestation. Treatments were not proposed in these sites due to the lack of cultural and botanical clearance, and to retain dense stands for habitat considerations. Areas were also avoided because of slope constraints associated with access road construction. With further review by District resource specialists, up to 250 of these acres could be treated with the proposed sanitation treatment described in Chapter 2.

Acres at Risk	Alt. A	Alt. B	Alt. C
1 – Low	7,498	8,782	8,750
3 – Moderate	7,830	7,341	7,118
5 – High	5,469	4,675	4,929

*Does not include stands without mountain pine beetle inventory data.

Table 5. Mountain Pine Beetle Risk Classes

White Spruce

There are approximately 189 acres of white spruce cover type in the Project Area. In addition, there are scattered spruce trees in many stands with a hardwood or pine cover type. Spruce stands were excluded from treatment to meet Revised Forest Plan standards and guidelines to protect marten habitat.

Hardwoods

Revised Forest Plan objective 201 requires conserving hardwood communities and restoring historic hardwood communities by 10% over 1995 conditions. In 1995, the Forest Plan identified 387 acres of hardwood community type within the Project Area. Current data identifies 497 acres of hardwood cover type, which exceeds this objective. Under Alternative B, 79 acres would be treated to restore hardwood communities and 40 acres would be treated under Alternative C.

Grass/Forb Structural Stage and Grassland

Revised Forest Plan objective 209 requires managing at least 5 percent of a timber harvest Project Area for the grass/forb structural stage. The Project Area is currently below the objective in terms of amount of grass/forb structural stage. There would need to be 1,238 acres of the 24,754 forested acres in the grass/forb stage to meet the objective. There are currently 268 acres in the grass/forb structural stage. Both action alternatives would increase this by 383 acres. Both action alternatives move toward the objective.

Revised Forest Plan objective 205 requires restoring grassland communities by 10% over 1995 conditions. In 1995, the Forest Plan identified 686 acres of Grassland covertype in the Project Area. There are currently 924 acres of Grassland cover type, which exceeds this objective. Both action alternatives would restore 93 acres to grassland. Of these, 5 acres are currently classified as suitable for timber production (see project file), but were previously a grassland cover type.

3.1.2 Cumulative Effects on Vegetation

This area has been modified by humans since the late 1800s by settlement, including road building, fire suppression, human-caused fires, grazing, mining, and timber harvest for firewood and construction.

Under the action alternatives, approximately 11% of the National Forest land in the cumulative effects area would be treated. The Merritt, Unction and Bolt timber sales have occurred in the project area since 1991, and have treated a total of 8,589 acres or approximately 33% of the National Forest land in the cumulative effects area. In addition, the Minnex sale is ongoing in the area and involves treatment of an additional 1,910 acres. Despite the large percentage of the area that has been managed in the recent past, the selective nature of the harvest reduces the likelihood that these actions have made a difference in the resource's ability to sustain itself or potential to do so in the future. The proposed actions would not alter this cumulative effect.

Another cumulative effect of past and proposed harvest is that stand structure and composition tend to be fairly homogenous across the analysis area. The continuous nature of the forest cover can allow crown fires to run for long distances under certain weather conditions. The no action alternative would add to this effect over time, and heavy fuel loading from snowstorms would remain a fire hazard. Alternatives B and C would counteract this effect to a small degree by varying stand structure, decreasing ladder fuels and creating fuel breaks.

Cumulative effects on mountain pine beetle activity are not well understood. Little is known about pre-settlement beetle outbreaks (Parrish et al. 1996). Modern silviculture attempts to reduce risk of infestation, but outbreaks still occur. Both action alternatives would reduce beetle risk in treated stands and may reduce risk of spread, but risk will continue to be present under all alternatives.

3.2 Fire and Fuels

This section summarizes the fuels specialist's report (located in the project file), which contains data, research references and detailed analysis of effects on fire and fuels. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Plan direction.

The Project Area has been intensively managed for timber and other forest products. Some activities associated with these treatments, such as lop-and-scatter slash disposal, have resulted in increased fuel loadings. In addition, prolific regeneration of ponderosa pine following harvest entries has resulted in a backlog of acres in need of precommercial thinning. As a result, ponderosa pine is on average denser (though of smaller diameter) and more extensive with reduced understory productivity. Intensive forest management and the absence of wildfire due to fire exclusion over the past 100 years, combined with the urban and rural development taking place on the BHNF, have compounded these fuels management issues. The Project Area has received minimal treatment by prescribed fire. Disposal of purchaser-created slash through jackpot burning and underburning following timber harvest has accounted for the majority of prescribed fire activities.

3.2.1 Direct and Indirect Effects on Fire and Fuels

Under Alternative A, the proposed fuel treatments would not be implemented and existing ecosystem trends and processes would continue. Wildfire suppression would continue according to the BHNF Fire Management Plan (USDA 2003a). The concerns of escaped prescribed fire would be mitigated under this alternative, as prescribed fire activities would not take place. A large wildfire occurring in the Project Area, however, may cause extensive losses given the existing public and private values and existing fuel conditions.

Under Alternative B, hazardous fuels reduction treatments are proposed on 1,218 acres. Alternative C proposes 1,147 acres of hazardous fuels reduction. Specific treatment types and acreages are identified in the description of the alternatives section in Chapter 2.

Under Alternative B, these treatments would reduce fuels on approximately 285 acres designated as WUI (13% of the WUI in the Project Area), whereas Alternative C would treat 246 acres of fuels designated as WUI (12% of the WUI in the Project Area). Under both action alternatives, these treatments would also occur on approximately 17 acres around the town of Rochford, a designated CAR. These fuel treatments in areas adjacent to developments and communities would reduce the potential catastrophic effect of a wildfire.

Fuel treatments in ponderosa pine are a way to reduce or retard wildfire spread and intensity (USDA 2004a). Stands would be thinned to raise crown heights, remove some of the ladder fuels, and reduce the potential for crown fires.

Proposed treatments include 473 acres of jackpot and prescribed burning in Alternative B and 460 acres of the same actions in Alternative C. Prior to implementing any

burning, a site-specific burn plan would be developed addressing public and private interests and safety concerns.

3.2.2 Cumulative Effects on Fire and Fuels

Fire hazard and fuel loading have changed considerably since pre-settlement times (USDA 1996). Generally, suppression of fire over the last century resulted in a more continuous forest. Though timber harvest reduced fire hazard where dense stands were thinned, lack of low-intensity fires often resulted in a buildup of naturally occurring fuels. Most fuel reduction activity that has previously occurred in the project area has been in association with the slash generated from timber harvest. For instance, both the Bolt and Unction timber sales occurred in the cumulative impacts area since 1988. These sales included approximately 1,400 acres of brush disposal activities such as lopping and scattering of slash, and 70 acres of piling and burning. The Minnex timber sale is currently ongoing and includes approximately 1,700 acres of lopping and scattering slash, 230 acres of burning, and 26 acres of piling and burning fuelbreaks. Current standards require reduction of excess fuels resulting from timber sales.

Excess fuels outside timber sales have often been left in place due to lack of funding or emphasis, but the National Fire Plan (USDA 2001) provides focus on treatment of these natural fuels. This emphasis is occurring not only for this project, but for other vegetative management projects occurring across the entire BHNF. Legislation signed into law in August 2002 authorized the Forest Service to treat mountain pine beetle infestation and hazardous fuel conditions on 8,000 acres in the northeast part of Northern Hills Ranger District.

Other ongoing activities within the project area that contribute to cumulative effects to fuels management include recreational firewood cutting and timber harvest on private lands. Development of private land continues to increase fire hazards and values at risk. This compounds problems in the wildland/urban interface for Federal, State and local fire managers.

The project would reduce fire hazards where timber harvest and fuel treatments take place, to some degree counteracting the cumulative effects of fire suppression in those areas. It would also contribute to the overall Forest-wide goal to reduce hazardous fuel conditions across the Forest.

3.3 Wildlife, Fish and Special Plants

This section summarizes the Biological Evaluations/Biological Assessments (BE/BA) and Analysis Reports for Threatened, Endangered, Sensitive, and Management Indicator Species contained in the project file, located at the Northern Hills Ranger District office. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

3.3.1 Effects on Wildlife

Wildlife Habitat

Snags

Snags are an important habitat component for many species. Primary cavity nesters such as black-backed woodpeckers regularly excavate cavities in trees having heartwood rot. Other species, including secondary cavity nesters such as the white-breasted nuthatch, also use natural cavities or abandoned woodpecker cavities for nesting (USDA 1996 Appendix H). Specific direction was set in the Revised Forest Plan and Phase I Amendment to maintain habitat for cavity nesters.

The Project Area was analyzed assuming that existing snag density does not meet Revised Forest Plan direction. Retention of at least 5 large-diameter live trees per acre would provide large-diameter snags over time. Replacement trees would be representative of the largest diameter class available.

Direct and Indirect Effects on Snags

Both action alternatives include treatments that would impact snag habitat recruitment and management in future planning cycles. Overstory removal treatments proposed in these alternatives limit the number of trees available for recruitment into the snag base. For this reason, snag replacement trees would need to be retained to insure minimum snag densities over time as required under the Revised Forest Plan. Standard 2301 requires that snags must be at least 10" DBH and 25 feet tall; 25% of the minimum number per acre must be at least 20" DBH or the largest size available. Replacement trees would be representative of the largest diameter class available and may include trees with broken tops or evidence of crown decay or which are otherwise deformed or damaged. In addition, existing snags would be protected during treatments as identified in Section 2.1.5. Alternative B includes the most acres of overstory removal treatments and commercial thin treatments. As a result, this alternative would have the greatest potential for long-term negative impact on snag distributions within the Project Area. Five snag retention trees per acre would be left in overstory removal units to meet Revised Forest Plan snag objectives.

Cumulative Effects on Snags

The number of snags in the Project Area has probably been reduced because of previous timber harvesting and firewood sales, where snags were often cut. Because of the current prohibition on cutting of standing snags unless they represent a safety hazard, the alternatives would add very little to this cumulative effect. Road closures included in Alternative C and, to a lesser extent, Alternative B, would further discourage cutting of snags for firewood. The incremental change in cumulative effects under any alternative would be negligible.

Retention of 5 green trees per acre would prevent further loss of habitat and ensure compliance with Revised Forest Plan standards and guidelines.

Late Succession

Objective 207 of the Revised Forest Plan requires that 5% of the forested landbase be managed for late succession. This can include Management Area 3.7 (late succession forest landscapes) and other Management Areas. The Project Area does not include

Management Area 3.7, but does contain approximately 197 acres of late successional habitat.

Effects on Late Succession Habitat
There would be no impact to existing late successional habitat in the Project Area, because none of the involved area would be treated under any alternative. The habitat would be retained and provide goshawk and marten habitat. Proposed thinning and fuel treatments outside of late successional habitat would increase growth and decrease the likelihood that stands would be lost to insects or wildfire. These stands could develop closed-canopy late succession characteristics through time depending on future management.

Cumulative Effects on Late Succession Habitat
This area has been modified by humans since the late 1800s by settlement, including road building, fire suppression, human caused fires, grazing, mining, and timber harvest for firewood and construction. Past and ongoing timber sales in the area have created a landscape that is more continuously forested. Stands are more densely stocked and trees are generally smaller (USDA 1996 p. III-136).

Existing late successional habitat in the Project Area is not affected by any of the alternatives, so the project would have no cumulative effect on existing late successional habitat. In addition, the potential increases to late successional habitat associated with the proposed thinning and fuel treatments under any alternative would be negligible.

Threatened, Endangered, and Proposed Wildlife and Plant Species

A BE/BA was prepared to evaluate effects on species listed under the Endangered Species Act. The U. S. Fish and Wildlife Service (USFWS) list of endangered and threatened species for South Dakota was revised on January 7, 2004. The list for Pennington County includes the Whooping Crane, Bald Eagle, Least Tern, and Black-footed Ferret. The list for Lawrence County includes the Whooping Crane and the Bald Eagle. In addition, the American Burying Beetle is identified as potentially occurring throughout the entire State of South Dakota. There are no listed plant species for either county.

The Bald Eagle is the only federally listed species known or likely to occur in the Project Area. Habitat for the Black-footed Ferret is not known or likely to occur in or near the Project Area. On August 8, 2003, the U.S. Fish and Wildlife Service concurred with a determination by the BHNF that management on the Forest would not adversely affect the Least Tern, Whooping Crane, or American Burying Beetle (Twiss 2003).

Bald Eagle *(Haliaeetus leucocephalus)*
Bald eagles have not been documented in the Project Area and would not be affected by any of the alternatives. Vegetation treatment activities may remove trees that could serve as potential transitory roost sites, but sufficient trees would remain to satisfy this need. There are no known nests or traditional roost sites in the Project Area.

If any previously unknown bald eagle roost sites are discovered, or if any stands proposed for harvest are found to be used by eagles, Revised Forest Plan standard 3101 would provide protection.

Sensitive Wildlife Species

All Region 2 sensitive wildlife species that are known to occur or potentially could occur in the Project Area were considered in this analysis. The complete list of species appears in the wildlife Biological Assessment/Biological Evaluation, located in the project file. Only those species known to occur in the Project Area, or with suitable habitat in the Project Area, are discussed in this document. Table 6 displays these species.

Species	Potential Suitable Habitat In Project Area	Species Recorded in Project Area
Fringe-tailed Myotis	X	X
Townsend's Big-eared Bat	X	X
American Marten	X	
Northern Goshawk	X	X
Flammulated Owl	X	
Black-backed Woodpecker	X	X
American Three-toed Woodpecker	X	
Northern Leopard Frog	X	X
Black Hills Redbelly Snake	X	X
Mountain Sucker	X	X

Table 6. Sensitive wildlife species recorded or with suitable habitat in the project area

Fringe-tailed Myotis (*Myotis thysanodes pahasapensis*) and Townsend's Big-eared Bat (*Plecotus townsendii*)

Fringed-tailed myotis are primarily cave, mine, and building roosters; however, they have been known to roost under loose bark of snags for daytime roosting. Fringed-tailed myotis occupy a variety of habitats, including mid-elevation desert, grass and woodland habitats, and is found at higher elevations in spruce-fir habitat and in mixed timber of ponderosa pine, white spruce and aspen. While they have been reported to roost in caves, mine tunnels, and buildings, the only maternity colonies of this species that have been studied occurred in buildings (Schmidt 2002a).

Townsend's big-eared bat occupies a variety of habitats across its range. Most accounts of this species' habitat focus on the requirement of suitable roosts including caves, mines, and rocky ledges and overhangs. Throughout much of its range, it is common in mesic habitats with coniferous and deciduous forests (Schmidt 2002b).

The Project Area includes suitable habitat and known hibernacula for both species of bats. Three mines in the Project Area were gated during the summer of 2003 to protect hibernacula for both bat species. Surveys conducted at these three sites on January 14, 2004 showed all three sites were occupied by Townsend's big-eared bats; however, no fringed-tailed myotis were observed (Liddick 2004). One of the mines is on the boundary of a stand proposed for treatment under both action alternatives.

Direct and Indirect Effects on Fringe-tailed Myotis and Townsend's Big-eared Bat

The No Action Alternative would retain trees that could serve as day roosts for the fringed-tailed myotis.

Snags provide day roost habitat for fringed-tailed myotis. Snags would not be cut (see Section 2.1.5) unless they pose a hazard to workers. Individual myotis bats could be

adversely affected if snags with undetected roosts are cut. Revised Forest Plan standards requiring protective measures for snags and retention of green trees for snag replacements would provide roosting habitat over time.

Townsend's big-eared bats have not been documented to use snags as roosting sites, so proposals are unlikely to directly affect this species. Harvest activities would not occur within 150 feet of the mines used by this species (see Mitigation Section 2.1.5), thereby maintaining the mine microclimate in accordance with Revised Forest Plan guideline 3102 and standard 3107.

Cumulative Effects on Fringe-tailed Myotis and Townsend's Big-eared Bat

Past excavation of mines increased habitat for Townsend's big-eared bat. Past timber harvest and fire suppression may have cumulatively altered historic snag distribution and characteristics. Protective measures for snags and mines would prevent more than negligible addition by this project to cumulative effects. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat. No present or foreseeable future actions planned in the area would reduce habitat suitability for either species. Following Phase I Amendment standards and guidelines that protect important bat habitat (cave and mine resources) and snags would positively affect species viability Forestwide.

Determination (Fringe-tailed Myotis)
All alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. The project may impact individual fringed-tailed myotis if snags with unknown roost sites are cut for safety reasons. However, this would not be likely to cause a loss of viability on the Forest or cause a trend towards listing because most snags in harvest units and all snags in other parts of the Project Area would be left standing, and sufficient green trees would remain to meet snag density standards across watersheds in the future. None of the alternatives would alter the microclimate of mines used by Townsend's big-eared bats or fringe-tailed myotis.

Determination (Townsend's Big-eared Bat)
Project activities should have no impact on Townsend's big-eared bats because they roost and hibernate in caves and mines and neither would be affected by project activities. Furthermore, known roost sites and hibernacula would be protected by project mitigation (See Section 2.1.5).

American Marten (*Martes americana*)
American martens show a preference for spruce stands that are dense with abundant ground vegetation. They show a tendency to avoid open areas. Within home ranges, martens have been shown consistently to avoid openings created by recent clearcuts. Martens tend to select for moist-site tree species that grow in stands characterized by living branches on the lower boles of trees, abundant coarse woody debris (CWD), and lengthy fire return intervals (Buskirk 2002). Martens generally avoid habitats that lack overhead cover and are intolerant of habitat types lacking at least 30 percent canopy cover (USDA 2001a).

The Project Area contains approximately 189 acres of white spruce. No vegetation treatments are proposed within spruce stands. However, treatments are proposed in stands that provide connectivity between or adjacent to white spruce stands. Potential marten habitat is identified in three areas within the Project Area. There are no recorded marten sightings in the Project Area. A track-plate survey conducted in 2002 resulted in no detections.

Direct and Indirect Effects on Marten

Because no spruce would be treated, there would be little effect to marten habitat under any alternative. Alternative A would be the best alternative for martens because it would allow the forest structure to continue to become more dense with higher recruitment of dead and downed woody debris. Alternatives B and C would treat denser stands of ponderosa pine; Alternative B proposes treatment of 619 acres of 3C or 4C habitat (11% reduction) while Alternative C proposes treatment of 232 acres of the same habitat (4% reduction). Treatment in these dense stands makes both Alternatives B and C less desirable than Alternative A.

Both Alternatives B and C propose treatment in a ponderosa pine stand that provides a connectivity corridor between two spruce stands. Surveys have not detected presence of martens in this area. Forest standards 2308, 3117 and 3215 require protection of marten habitat under all alternatives. Mitigation is included in Section 2.1.5 of this EA to protect this corridor.

Direct effects are unlikely under any alternative due to the apparent absence of martens and the lack of preferred habitat in the Project Area. Vegetation management proposals that would reduce dense ponderosa pine stands and coarse woody debris may make the habitat less suitable for martens. However, none of the alternatives should have an effect on population viability in the Project Area since ponderosa pine marten habitat is sub-optimal, white spruce stands would not be treated, and martens evidently make little use of the area.

Cumulative Effects on Marten

Past timber harvest and subsequent slash cleanup may have negatively affected characteristics of marten habitat such as spruce, dense stands, and down woody debris. Conversely, fire suppression has probably allowed spruce stands to persist and expand. None of the alternatives would affect high-potential marten habitat and thus would not add to negative cumulative effects on marten; continued fire suppression may add to the cumulative effect of increasing spruce acreage and potential habitat. No known present or proposed actions on private or NFS lands would reduce preferred marten habitat. Project activities are expected to be neutral with regards to the marten given that there are only small amounts of spruce present and neither action alternative proposes treatment in spruce habitat. Since no observations of martens have been documented in the Project Area and suitable habitat is extremely limited, effects to Forestwide species viability resulting from proposed activities in the Project Area should be non-existent.

Determination

The proposed action and alternatives may adversely impact individuals, but would not be likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. The Project Area provides sub-optimal habitat and is probably used only by dispersing martens. Reducing dense stands of ponderosa pine may further reduce habitat suitability for dispersing individuals, but adherence to Phase I Amendment

standards and guidelines would maintain preferred marten habitat and marten viability across the Forest.

Northern Goshawk (*Accipiter gentilis*)

Goshawks are adapted to forested habitats and nest in mature, dense pine, but also use other trees such as quaking aspen, Douglas-fir, western larch, and grand fir. In the Black Hills, ponderosa pine is the only tree species in which goshawks are known to nest. Nest sites are typically composed of mature to old-growth trees with relatively dense canopy. These stands have been characterized as having a minimum size of 20 to 30 acres. Nest trees tend to be relatively large. Surrounding each nest site is a Post-fledging Family Area (PFA) estimated at about 420 acres. These areas have a mosaic of large trees, large snags, mid-aged trees, small openings with a productive herbaceous understory, and coarse woody debris. This diversity is thought to be important for maintaining prey populations. Nesting activity begins in early March.

The Project Area includes three known and/or historically active goshawk nests/territories, and suitable habitat exists throughout. One territory/nest was active during 2002 and 2003 surveys, and young were successfully fledged both years. No treatments are proposed within existing PFAs or within one-half mile of any known nests under either action alternative. Two known nests/territories exist outside the Project Area, but within one-half mile of the project boundary. No activities are proposed under either action alternative within one-half mile of these nests.

Two recent reports exist of goshawk nest vandalism in the northern Black Hills. This territory is located outside the Project Area. No nest vandalism is known to have occurred within the Project Area.

Direct and Indirect Effects on Goshawk

Direct effects could include mortality of nestlings if active nest trees are cut prior to young birds fledging. Because no known nest trees would be cut and any newly discovered nests would be protected in accordance with Revised Forest Plan standards and guidelines, the chance of direct mortality is negligible. Direct effects to adult birds are unlikely due to high mobility of the goshawk.

None of the alternatives would affect known nest stands or PFAs. Newly discovered nests would be protected. Across the Project Area, the No Action Alternative would have the fewest indirect effects on potential goshawk nesting habitat, though over time these stands could stagnate and become more susceptible to insect infestation and stand-replacing wildfire. Alternative B proposes treatment of 619 acres of 3C and 4C habitat (11% reduction) while Alternative C proposes management of 232 acres of the same habitat (4% reduction). Under both action alternatives, over 5,000 acres of suitable nesting habitat would remain.

The 2002 BHNF monitoring report (USDA 2004b) indicates Forestwide trends may be stable to slightly decreasing, but fluctuating sample size may explain this change. The Phase I Amendment BA/BE determined that following established standards and guidelines would maintain viability across the Forest. All proposed treatments in the Project Area comply with Phase I Amendment standards and guidelines established to protect viability of the goshawk. Areas between known territories within and near the Project Area are not large enough to form additional territories, so there was no "assumption of presence" or potential nest stand designation in these areas.

Cumulative Effects on Goshawk

Fire exclusion in the Black Hills has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The No Action Alternative would continue the trend of increased continuity of forest cover, which could affect goshawks through loss of openings for foraging and development of increased nesting habitat; risk of stand-replacing fire, which would destroy nesting habitat, would also increase. Conversely, the No Action Alternative would have less potential to disturb nesting and fledging goshawks, and would leave all potential nesting habitat intact; these effects would decrease the overall cumulative effects of human activity on goshawk habitat in the cumulative effects area. Snag retention and replacement measures included in the action alternatives would help assure a long-term supply of snags, also important as prey habitat. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on goshawk habitat.

Determination

The proposed action and alternatives may adversely impact individuals, but would not be likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. The majority of potential nesting habitat would remain. No management activities are proposed within the known nest stands or PFAs in the Project Area, and any newly discovered nests would be protected. Effects on Forest-wide species viability would be negligible.

Flammulated Owl *(Otus flammeolus)*

Flammulated owls prefer mature, open-canopy ponderosa pine forests with brush or saplings and avoid dense, young stands (McCallum 1994). This owl is primarily insectivorous, but is known to prey on small mammals and birds as well. Nests are in natural cavities or old woodpecker holes and are reused year after year.

This species had not been confirmed in the Black Hills before the summer of 2002. In June 2002, two to three flammulated owls were detected in the north-central hills (Panjabi 2003), about seven miles northwest of the Project Area. This observation does not necessarily prove that a flammulated owl population has become established in the Black Hills; further monitoring is needed.

No owl surveys were done in the Project Area. Based on published information, it is reasonable to expect that suitable habitat for flammulated owls is present.

Direct and Indirect Effects on Flammulated Owl

Alternative A would harvest no ponderosa pine and therefore would have no direct impact on flammulated owls. Natural mortality of trees would gradually increase snag numbers. Risk of stand-replacing fire, which would negatively affect flammulated owl habitat, could increase over time.

The action alternatives could cause direct mortality if unknown active nest trees are cut for safety reasons. Adult bird mortality is unlikely to occur.

Alternative B would increase mature, open-canopy pine stands (habitat structural stage 4A) by 172 acres (4%), while Alternative C would increase this habitat by 103 acres

(2.5%). Most existing snags would be retained (see Section 2.1.5). Flammulated owl habitat components would change little as a result of any alternative.

Cumulative Effects on Flammulated Owl
Fire suppression has decreased open habitats over time, and vegetation management has probably decreased density of large-diameter snags. The action alternatives would help counteract cumulative effects on flammulated owl habitat through some types of harvest and mitigation to ensure that snags are present across the landscape. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination
The proposed action and alternatives may adversely impact individual flammulated owls, but would not be likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. While individuals may be lost if unknown nests are removed during project activities, only a small amount of potential nesting habitat would be harvested. Effects on Forest-wide viability would be negligible.

Black-backed Woodpecker *(Picoides arcticus)*
Black-backed woodpeckers are associated with montane coniferous forests (Bent 1939, Terres 1987). Black-backed woodpeckers excavate cavities and forage on wood-boring insects in areas with concentrations of dead and decaying trees and logs. Literature suggests a strong tie to insect infestations, post-fire conditions, and snag habitats for nesting, foraging and roosting.

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last four years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 24 black-backed woodpeckers in 2001, 134 in 2002, and 75 in 2003 on fewer transects than were surveyed in previous years (Panjabi 2004). Preliminary data suggest that recent fire and beetle events may lead to detectable positive trends for the black-backed woodpecker (USDA 2004b). Current abundance, age of event, and pre-fire vegetative conditions could all influence the magnitude and timing of trends. No large fires or beetle events have taken place in the Project Area in recent years, though beetle numbers are clearly increasing in many areas and black-backed woodpeckers have been recorded.

Suitable habitat exists in the Project Area, mainly in pockets of dense timber and beetle-killed trees. There are no large areas of beetle infestation or large burned areas in the Project Area.

Direct and Indirect Effects on Black-backed Woodpecker
Alternative A would have no direct effects. Alternatives B and C could result in loss of nests if occupied nest trees are cut for safety reasons during timber harvest. Cutting of insect-infested trees and hazardous snags would reduce foraging habitat.

Twenty-one dense pine stands (habitat structural stages 3C and 4C) totaling 619 acres are proposed for treatment in Alternative B, while four such stands totaling 232 acres are proposed for treatment in Alternative C. More than 5,000 acres of potentially suitable habitat would remain in the Project Area.

Under the No Action Alternative, development of dense stands would increase risk of mountain pine beetle infestation in the absence of management or natural disturbance. These conditions and development of ladder fuels would increase the risk of stand-replacing wildfire. Both beetle infestations and stand-replacing fire would create black-backed woodpecker habitat.

Alternatives B and C include timber harvest prescriptions that would result in loss of large trees and reduction in stand density. Sanitation harvest could reduce foraging substrate and potential nesting sites. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species. Thinning treatments would promote the development of larger-diameter trees, which may eventually provide large-diameter snags.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative C and, to a lesser extent, Alternative B, would decrease disturbance across the Project Area.

Cumulative Effects on Black-backed Woodpecker

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The No Action Alternative would continue this trend, though susceptibility to insect infestations and stand-replacing fire would increase with stand density and stagnation; these events would increase habitat for black-backed woodpeckers.

Fire suppression would continue under all alternatives, and the type of burns proposed under Alternatives B and C would most likely not result in the type of post-fire conditions most suitable as black-backed woodpecker habitat. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on black-backed woodpecker habitat. In the absence of large fire or beetle events, the Project Area's suitability for this species would change little under any alternative. Effects on Forest-wide population trend would be negligible.

Determination

The proposed action and alternatives may adversely impact individuals, but would not be likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. Modifications to preferred habitat would be minor. Individuals may be affected during proposed activities, but effects on Forest-wide viability would be negligible.

American Three-toed Woodpecker *(Picoides dorsalis)*

The three-toed woodpecker is associated with montane forests, most often spruce (Clark et al. 1989). Foraging occurs in areas with abundant dead and decaying trees infested with wood-boring insects, especially newly burned areas (Hutto and Young 1999, Murphy and Lehnhausen 1998, DeGraaf et al. 1991). Nest cavities are excavated in trees with heart rot. Closed-canopy spruce stands are preferred for nesting (Weydemeyer and

Weydemeyer 1928), though dense, mature aspen stands are also used in the Black Hills. Keller (1987) suggested that three-toed woodpeckers may be sensitive to forest fragmentation, but Haldeman (1980) found this species in coniferous forests with openings and in logged areas.

The Forest monitors this species through the Rocky Mountain Bird Observatory. Other woodpecker studies have been conducted in the Black Hills in the last four years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 12 three-toed woodpeckers in 2001, 26 in 2002, and 44 in 2003 (Panjabi 2004). Most observations were in spruce habitats, which are protected under the Phase 1 Amendment, and this species has thus far not appeared in burned areas. The Project Area contains little suitable habitat due to its scarcity of spruce, but three-toed woodpeckers may use beetle-infested pockets. There are no records of this species in the Project Area.

Direct and Indirect Effects on Three-toed Woodpecker

No spruce stands or mature aspen are proposed for cutting under any alternative. Alternative A would have no direct effects. Alternatives B and C could result in loss of nests if any are in aspen or pine trees cut for safety reasons. Cutting of insect-infested trees and hazardous snags could reduce foraging habitat.

Under Alternative A, development of dense stands would increase risk of mountain pine beetle infestation. These conditions and development of ladder fuels would increase the risk of severe wildfires. Small wildfires could create three-toed woodpecker foraging habitat, though stand-replacing fires could also destroy preferred habitat.

Alternatives B and C include timber harvest prescriptions that would result in loss of large trees and reduction in stand density; sufficient trees would be left to meet Revised Forest Plan direction to provide large-diameter green trees across the landscape, which presumably would eventually provide enough snags for this species. Sanitation harvest could reduce foraging substrate and potential nesting sites. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species. Prescribed fire proposed under the action alternatives could increase habitat by killing trees, though this effect should not be widespread since the main objective of most of the burns is to clean up fuels in the understory with limited overstory mortality. Thinning treatments would promote the development of larger-diameter trees, which would eventually provide large-diameter snags. Actions would probably have a negligible effect on this species due to the scarcity of spruce forest in the Project Area.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative B and, to a lesser extent, Alternative C, would decrease disturbance across the Project Area.

Cumulative Effects on Three-toed Woodpecker

Recent timber sales harvested 95 acres of spruce habitat in the cumulative effects area. Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The No Action Alternative would continue this trend, though susceptibility to insect infestations and wildfire would increase with stand

density and stagnation; these events may increase habitat for three-toed woodpeckers. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on three-toed woodpecker habitat. In the absence of large fire or beetle events, the Project Area's suitability for this species would change little under any alternative. The proposed activities are unlikely to impact three-toed woodpeckers in the Project Area or their population trend across the Forest.

Determination
The proposed action and alternatives may adversely impact individuals, but would not be likely to result in loss of viability in the Planning Area, nor cause a trend toward federal listing. Modifications to preferred habitat would be minor. Individuals may be affected during proposed activities, but effects are considered to be unlikely. Effects on Forest-wide species viability would be no more than negligible.

Northern Leopard Frog
Leopard frogs generally avoid faster moving water and are most abundant in small stock ponds and beaver ponds lacking predatory fish. They over-winter in permanent water that does not freeze solid and forage in upland sites where there is adequate cover.

There are five documented leopard frog observations within the Project Area boundary. There are numerous small streams, stock ponds and other water sources throughout the Project Area that provide suitable habitat for the leopard frog. No management activities proposed under any of the alternatives would take place in riparian habitat. In the Project Area, riparian habitat represents the best available reproductive habitat for frogs.

Direct and Indirect Effects on Northern Leopard Frog
Under Alternative A, motorized vehicles could continue to disturb wet areas and possibly kill frogs. Road work and timber harvest proposed under Alternatives B and C could result in the death of frogs, but with implementation of the WCPs and BMPs, the chances of this occurring would be small. Road closures, especially in Benner Gulch, may decrease direct negative effects on frogs.

Potential riparian habitat could continue to be disturbed and negatively affected by motorized vehicles under Alternative A. Road work and timber harvest proposed under Alternatives B and C could temporarily disturb frog foraging habitat. Though reproductive sites would be affected little, vegetation treatments in upland foraging areas could make this species more vulnerable to predation, as could dispersal to water bodies that contain predatory fish (Smith 2003a). Indirect effects on frogs would be negligible with implementation of measures to prevent or minimize impacts on water quality and moist soils.

Cumulative Effects on Northern Leopard Frog
Fire exclusion and other events have cumulatively altered historic riparian and wetland areas. None of the alternatives is likely to add to cumulative effects, and road closures may help counteract cumulative effects.

Determination
The proposed action and alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Mortality to individual frogs may occur as a result of harvest activities and machinery, but adherence to Revised Forest Plans standards and guidelines should result in no more than negligible effects on Forest-wide viability.

Black Hills Redbelly Snake ***(Storeria occipitomaculata pahasapae)***
This subspecies of the redbelly snake occurs in the Black Hills of South Dakota and Wyoming, though it has been documented in one other location roughly 80 miles northeast of the Black Hills (Smith 2003b). It is found in moist woodlands with rocks, logs, leaf litter, and other cover. Redbelly snakes often hibernate in rocky areas and may be killed crossing roads that run between rocky hibernation sites and riparian woodlands. This species feeds on slugs, earthworms, and soft-bodied insects, and is inactive from November through March (Behler and King 1979). There are two records of this species in the Project Area. Informal surveys for redbelly snakes were conducted in 2003 during goshawk surveys. None was located.

Direct and Indirect Effects on Black Hills Redbelly Snake
High open road density under Alternative A could result in roadkill of snakes. Snakes could also be killed by road traffic, harvest activities, and prescribed fire associated with Alternatives B and C. Proposed road construction would not take place between wetlands or riparian areas and known or potential hibernacula (standard 3116). Alternative A would have no immediate indirect effects on this species. In the long term, lack of management or natural disturbance could reduce habitat diversity. Closure of roads under Alternative C and to a lesser extent Alternative B would reduce the chances of vehicle-caused mortality of snakes on these roads, while construction of roads under Alternative B could increase mortality. Attempts to escape from prescribed fire could result in mortality due to predation and roadkill. These effects are more likely under Alternative B, which includes more prescribed burning.

Alternative B proposes 79 acres of hardwood restoration, while Alternative C proposes this treatment on 40 acres. Due to cover type, these stands may have a higher than average likelihood of use by redbelly snakes. Increased direct mortality could occur during these treatments. Hardwood restoration treatment would not affect the habitat's suitability for this species. No new barriers such as open roads would be created between redbelly snake habitat or wetlands and hibernacula. Habitat would remain suitable for this snake during and following treatment, thus allowing for continued use and occupancy.

Cumulative Effects on Black Hills Redbelly Snake
Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. The No Action Alternative would continue this trend. Alternatives B and C would counteract effects of prior management to some degree by small-scale reintroduction of fire, reduction of stand density, restoration of hardwoods, and road closures. These changes would benefit redbelly snakes.

Determination
The proposed action and alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward

federal listing. Proposed treatments in both action alternatives may cause direct mortality to individual snakes. Adherence to Phase I Amendment standards and guidelines and BMPs should result in no more than negligible effects on Forest-wide viability.

Snail Species of Interest

The Revised Forest Plan contains direction to protect all known colonies of several snail species: *Vertigo arthuri* von Martens, *Vertigo paradoxa* Sterki, *Catinella gelida* Baker, *Oreohelix strigosa* n. subsp., and *Oreohelix strigosa berryi* Pilsbry (standard 3103). One colony in the Project Area contains representatives of *Vertigo arthuri* (Frest 2002). The colony would be avoided and would not be affected by any of the actions associated with any alternative. Specific mitigation to protect this colony from inadvertent disturbance is identified in Section 2.1.5 of this document.

Management Indicator Species

Management indicator species (MIS) can be used to indicate effects on a wider group of species that share similar habitat requirements. MIS can also be species of particular interest for other reasons, e.g. sensitive species or big game. The MIS discussed in this analysis were selected to represent the effects of management activities on those species relevant to this project. The page where the species is discussed in this document is identified below in Table 7.

MIS that occur in the Project Area and may be affected by project activities include the American marten, black-backed woodpecker, three-toed woodpecker, northern goshawk, pygmy nuthatch, fringed-tailed myotis, white-tailed deer, elk, brown creeper, Merraim's turkey, and mountain lion. MIS fish species that occur in the Project Area and may be affected by the project include the brook trout, brown trout and mountain sucker.

Wildlife species not selected for MIS analysis include the bald eagle, Cooper's Rocky Mountain snail, Cockerell's striate disc, Townsend's big-eared bat, osprey, regal fritillary butterfly, mule deer, and mountain goat. The bald eagle is discussed on page 44 and project activities were determined to have no effects because there are no known nests or traditional roost sites in the Project Area. The Townsend's big-eared bat is discussed on page 45; project activities were determined to have no effects because roosting and hibernating areas would not be affected. Cooper's Rocky Mountain snail, Cockerell's striate disc, osprey, mountain goat, and regal fritillary were not selected for analysis because neither they nor their habitat occur in the Project Area. Mule deer were not selected for analysis because effects on mule deer would be identical or very similar to the effects discussed for white-tailed deer and/or elk. Fish species not selected for MIS analysis include the finescale dace and lake chub. They were not selected because they are not found in the Project Area.

Analysis Species	Page	Analysis Species	Page
American Marten	46	Mountain Lion	59
Black-backed Woodpecker	51	Mountain Sucker	67
Brook Trout	69	Northern Goshawk	48
Brown Creeper	57	Pygmy Nuthatch	60
Brown Trout	70	Rocky Mountain Elk	61
Fringe-tailed Myotis	45	Three-toed Woodpecker	52
Merriam's Turkey	58	White-tailed Deer	62

Table 7. Location of MIS discussion in document

Brown Creeper *(Certhia americana)*

Brown creepers are found in dense, mature coniferous forests in summer and deciduous forests in winter (Kistler and Fager 1981). Nests of twigs and mosses are built under loose bark of dead trees at least 10" in diameter. Brown creeper diet is composed of insects and larvae including weevils, leaf beetles, aphids, ants, caterpillars, moths, and spiders (Terres 1987). Optimal habitat in the Black Hills is spruce and pine structural stages 4B, 4C, and 5. There are currently 12,024 acres of 4B and 3,830 acres of 4C in the Project Area.

Direct and Indirect Effects on Brown Creeper

Individuals could be affected if snags with occupied nests were cut during activities proposed under Alternatives B and C. Only hazardous snags would be cut (See Section 2.1.5), so effect is expected to be negligible.

Alternative A would not alter the brown creeper's preferred habitat. This alternative would result in an increase in brown creeper habitat over time. It would also, however, allow continued development of ladder fuels and increases in risk of mountain pine beetle infestation. These conditions would increase the risk of severe wildfires. Stand-replacing fire would destroy brown creeper habitat in burned areas, and this habitat would not again be available until large-diameter trees and snags developed.

Alternatives B and C include timber harvest prescriptions that would result in loss of large trees and reduction in stand density. Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape would be met, which would presumably eventually provide enough snags for this species. Alternative B would decrease structural stage 4B to 10,440 acres (-13.2%) and 4C to 3,471 acres (-9.4%). Alternative C would decrease structural stage 4B to 10,274 acres (-14.6%) and 4C to 3,606 acres (-5.8%). Alternative B has the greatest potential for negative effects on brown creeper.

Potential nesting sites would be lost under Alternatives B and C if snags are cut as safety hazards. Mitigation and design criteria would minimize loss of existing snags (see section 2.1.5). Alternative B would enhance 79 acres of potential winter habitat, and Alternative C would enhance 40 acres. Thinning treatments would prevent stand stagnation and allow development of larger trees over time. Risk of stand-replacing fire and resulting habitat destruction would decrease.

Road construction proposed under Alternative B could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative C and, to a lesser extent, Alternative B, would decrease disturbance across the Project Area.

Cumulative Effects on Brown Creeper

Timber harvest and road building have decreased habitat for this species by removing large trees and snags and preventing widespread natural mortality of large trees. Fire suppression has probably decreased hardwood acreage. This project would continue the trend of loss of mature, closed-canopy stands. Retention of unharvested stands and development of large-diameter trees over time as a result of silvicultural treatments are expected to have minimal cumulative effects.

Proposed road closures would discourage cutting of snags for firewood. Because all new roads and some existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

The Forest monitors this species through the Rocky Mountain Bird Observatory. One hundred and fifty-three brown creepers were observed in 2001, 145 in 2002, and 136 in 2003 on half the transects conducted in previous years (Panjabi 2004). Habitat appears to be stable or decreasing very slightly (USDA 2004b). Preliminary data suggest a strong association between brown creeper and older forests.

Anderson and Crompton (2002) reported that the brown creeper used only the densest portions of the forest and that these areas were characterized by large pines as well as a dense midstory. Creepers are often closely associated with late-successional ponderosa pine forests and may be the species most sensitive to timber removal (in the authors' study area). They further reported that in untreated forests, creepers were found only in patches of at least 100 hectares (about 240 acres). Both action alternatives may reduce patch size of some 4B and 4C stands, but approximately 9,300 acres of untreated 4B and 4C habitat in patches greater than 240 acres in size would remain after treatment.

Alternative B would decrease mature forest by 9.3%, including a decrease in dense, mature forest of 9.4%. Alternative C would decrease mature forest by 9.1% and dense, mature forest by 5.8%. In harvested stands, retention of most snags would preserve a critical element of brown creeper habitat. Effects on brown creeper in the Project Area are expected to be minor, and effects on Forest-wide population trend would be negligible. Following Forest Plan direction, objectives for balance of structural stages, and protecting old growth designated forest should result in no loss of viability Forestwide.

Merriam's Turkey *(Meleagris gallopavo)*

Habitat used by Merriam's turkeys includes coniferous, deciduous, and mixed woodlands (Tallman 2002). Selected habitat during the summer is open ponderosa pine, while winter habitat is dense ponderosa pine. Meadow habitat is seldom selected by adult turkeys. Poults tend to select meadow/forest edges and are seldom observed more than 10 meters from the forest edge (Rumble 1990). Roost trees selected by Merriam's turkeys are typically large-diameter, older trees with flat tops and large horizontal branches (Rumble 1992). During the summer, turkeys consume grasses and grass seeds as primary food categories, with brome grass seeds being the most common.

During the winter, ponderosa pine seeds are consumed where available. Kinnikinnick (*Arctostaphylos uva-ursi*) seeds are consumed in late winter and during other periods when pine seeds are unavailable. Poults consume large quantities of invertebrates (Rumble 1990). Habitat selection seems to coincide with diet composition; open pine habitats selected during summer had more understory vegetation, whereas dense ponderosa pine winter habitats had the greatest availability of pine seeds.

The northern limit of the original range of Merriam's turkeys was concurrent with the distribution of ponderosa pine/oak forest in southern Colorado. Thus, wild turkeys were not native to South Dakota. Wild turkeys were transplanted in South Dakota in three separate releases of 8, 15, and 6 birds in 1948, 1950, and 1951 respectively. By 1952, the population of turkeys in the Black Hills of South Dakota and Wyoming was estimated to be 100 and by 1960, 5,000-7,000 (Rumble 1990).

Direct and Indirect Effects on Merriam's Turkey

The No Action Alternative would allow for the continued increase of dense ponderosa pine canopy cover that may provide more preferred wintering habitat. This alternative could also increase mature/overmature trees that are preferred for turkey roosting. Continued canopy closure resulting from this alternative may reduce preferred habitat in summer, when turkeys tend to select more open canopy ponderosa pine cover.

Both action alternatives propose vegetation management activities that would alter turkey habitat. No direct effects would be anticipated under either alternative because of the mobility of the species. They should easily be able to escape harm or injury resulting from activities under either alternative. Indirect effects from Alternative B would include a reduction of dense canopy ponderosa pine by 464 acres, resulting in less preferred winter habitat. Alternative C would reduce preferred winter habitat by 124 acres. Both action alternatives would maintain turkey roosting habitat by retaining at least 5 green trees per acre in accordance with Revised Forest Plan Guideline 2305. Alternative B would provide an increase of preferred summer habitat of 544 acres and Alternative C would increase preferred summer habitat 476 acres.

Cumulative Effects on Merriam's Turkey

Forest Plan Objective 217 supports habitat management for 20,000 to 30,000 turkeys in South Dakota. Turkey populations are monitored through South Dakota Department of Game, Fish and Parks (SDGF&P). While the No Action Alternative would allow for the continued growth of a more dense forest in the Project Area, both action alternatives propose treatments that would alter structural stages, resulting in differing mixes of preferred summer and winter habitat. Untreated areas in both alternatives would continue to grow more dense, providing more suitable wintering habitat, while treated areas would become more open, providing more preferred summer habitat. Estimates of turkey populations show a doubling of turkey populations between 1998 and 2002, growing from 9,000 birds to 18,500 birds respectively (USDA 2004b). Both action alternatives should provide a mix of open and closed ponderosa pine stands that support Forest Plan Objective 217 and ensure population viability and increasing population trend Forest-wide.

Mountain Lion *(Felis concolor)*

The mountain lion's range has been drastically reduced from that of historical times. Its current distribution, primarily in western North America, is closely tied to its main prey,

mule deer and white-tailed deer. Mountain lions typically occur in remote, undisturbed areas, including mountainous habitat, watercourses with sufficient cover, riparian woodlands, and rough broken country with rocky cliffs or ledges (Higgins et al. 2000). Home range size varies with season of year, prey distribution and density, and an individual lion's age and sex.

Mule deer are the most important prey item, and mountain lions often follow the seasonal migration of this species. Other important foods include white-tailed deer, elk, bighorn sheep, hares, other small mammals, and porcupines, which mountain lions favor despite their quills (Higgins et al. 2000). Mountain lions have few enemies besides humans, and mortality usually results from hunting or control of lions preying on livestock. Although numbers are reduced from historical times, mountain lions are currently expanding in parts of their range. The indicated probable range for South Dakota is conservative, since mountain lions appear to be expanding eastward from the Black Hills and surrounding counties. The Black Hills 2002 Monitoring and Five Year Evaluation Report (USDA 2004b) states that mountain lion sightings have increased over the past five years and SDGF&P believes the population is increasing.

Direct and Indirect Effects on Mountain Lion

Direct effects are not foreseen under any of the alternatives due to the lion's mobility and apparent avoidance of human presence and activities. The No Action Alternative would result in lower habitat capability for mountain lion prey species and may impact the mountain lion negatively. If the action alternatives result in increases in white-tailed deer, mule deer, and elk populations, there could be an indirect beneficial effect on mountain lions. Both action alternatives indicate improvements in habitat capability for these mountain lion prey species.

Cumulative Effects on Mountain Lion

While no population objective has been established by SDGF&P for mountain lions, the population trend is reported to be stable to upward (USDA 2004b). This project meets Forest Plan Objectives 217, 218, and 221 for maintaining, conserving and enhancing habitat and increasing habitat capability for deer and elk. Increasing habitat capability for deer and elk should positively affect mountain lion primary prey items and result in positive effects for mountain lions. The project is not anticipated to detrimentally effect species viability or population trend Forest-wide.

Pygmy Nuthatch *(Sitta pygmaea)*

Pygmy nuthatches show a strong and almost exclusive preference for yellow pine forests, and their geographic range is almost co-extensive with that of ponderosa pine. They have also been found in pinyons, junipers, and other pines (Terres 1987). The pygmy nuthatch feeds almost exclusively in pines. It explores the whole tree for food, and is a more generalized feeder than chickadees and other nuthatches. Pygmy nuthatches typically seek static insect food in needle clusters, cones, twigs, branches, and trunks. Because the pygmy nuthatch nests primarily in dead pines and live trees with dead sections, it prefers mature and undisturbed forests that contain a number of large snags. Pygmy nuthatch abundance correlates directly with snag density and foliage volume of the forest, but inversely with trunk volume, implying that it needs heterogeneous stands with a mixture of well-spaced, old pines and vigorous trees of intermediate age (Ghalambor 2003). They require large-diameter snags (at least 17" DBH) for excavation of nest sites (Raphael and White 1984). They feed on spittle insects,

ants, wasps, moths, caterpillars, beetles, grasshoppers, spiders, and pine seeds. Kistler and Fager (1981) estimated territory size at 2.5 acres.

Habitat in the Project Area suitable for the pygmy nuthatch is structural stage 4A with numerous large snags and a grass understory. There are approximately 4,188 acres of habitat structural stage 4A in the Project Area. There is little information on existing snag density, but field review suggests that large-diameter snags are not common in most stands. This species has not been observed in the Project Area and has been observed only on rare occasions across the Forest.

Direct and Indirect Effects on Pygmy Nuthatch
Under Alternative A, natural mortality of trees would gradually increase snag numbers. Retention of all existing snags and possible increases in tree mortality would benefit this species if it occurs in the Project Area.

Individual birds could be affected if snags with occupied nests were cut during activities proposed under Alternatives B and C. These alternatives could reduce preferred habitat for this species by removing large overstory trees and cutting hazardous snags. Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape would be met, and presumably would eventually provide enough snags for this species. Silvicultural treatments aimed at reducing mountain pine beetle and other insect pathogens could reduce prey populations. Sanitation harvest could reduce foraging substrate and potential nesting sites.

The action alternatives could also increase pygmy nuthatch habitat through creation of open pine forest and mature, single-story stands. Alternative B would increase structural stage 4A by 2.5%, Alternative C by 4.3%. These stands would be of less value if snags are scarce. Road construction proposed under Alternative B could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities. Road closures proposed under Alternative C and to a lesser extent under Alternative B would decrease disturbance across the Project Area.

Cumulative Effects on Pygmy Nuthatch
The Forest monitors this species through the Rocky Mountain Bird Observatory. Three pygmy nuthatches were observed in 2001, two in 2002, and none in 2003 on fewer transects than were surveyed in previous years (Panjabi 2004). The species' rarity is confirmed through Breeding Bird Survey efforts, as only one bird has been detected on the Forest despite numerous annual surveys. Habitat appears to be stable or decreasing slightly (USDA 2004b). This species appears to be associated with snags and relatively large trees (Keller 1987); all alternatives would retain most snags and the majority of mature trees, so effects on Forest-wide population trend are likely to be negligible. Following Forest plan direction for snag retention, and structural and age class diversity should ensure species viability Forest-wide.

Rocky Mountain Elk *(Cervus elaphus)*
Rocky Mountain elk habitat includes meadows and other brushy open areas used for forage and denser timber used as cover. In summer, elk rely on grasses, sedges, and forbs, while the winter diet is principally twigs, leaves, and grasses (Higgins et al. 2000). The majority of the Project Area is mapped as summer range and annual range (SDGF&P 2004). Optimal summer habitat in the Black Hills is meadows, aspen

structural stages 1-5, pine and spruce structural stages 1, 2, 3A, and 4A for forage, and pine 3C, 4C, and 5 and spruce 3C, 4B, 4C, and 5 for cover. Optimal winter habitat is meadows, aspen structural stage 2, pine 1, 2, 3C, 4C, and 5, and spruce 1, 2, 3C, 4C, and 5.

Direct and Indirect Effects on Elk

Under Alternatives B and C, elk may be temporarily displaced during harvest and other proposed activities. High open road density under Alternative A would continue to facilitate road-hunting.

Table 8 shows habitat effectiveness by alternative and season for elk in management area 5.1. There are no habitat effectiveness guidelines for management area 5.3A. The ARC/HABCAP model was used to calculate habitat effectiveness. This model considers amount and spatial distribution of forage, cover, and roads to estimate the percent of optimal habitat provided by the analysis area.

Season	Alternative A	Alternative B	*Alternative C*	*Guideline (Minimum)*
Summer	*.42*	*.46*	*.50*	*.43*
Winter	*.34*	*.47*	*.48*	*.34*

Table 8 displays overall habitat values for Management Area 5.1. Individual forage, cover, and distribution values are documented in the project file

Table 8. Habitat Effectiveness for Elk, MA 5.1

As shown above, habitat effectiveness for elk is currently just below the summer guideline and at the winter guideline. Both action alternatives would increase habitat effectiveness in both seasons, in large part due to road closures.

Cumulative Effects on Elk

Forest management activities that have opened conifer stands have probably improved preferred habitat over time, while roading has decreased security. Actions proposed under Alternatives B and C would add to the effects of harvest and act against the effects of roading. The Black Hills elk population has increased over the last few years, from roughly 3,000 in 1998 to an estimated 4,190 in 2002 (USDA 2004b). There are no known activities, future or ongoing, on private land, that would have a negative cumulative effect on habitat capability for elk. Timber sales on private land would reduce cover values but would increase feeding values and the effects would be cumulative to proposed activities if they occurred. Private land that is subdivided would reduce habitat capability by reducing forage and increasing vehicle traffic. The action alternatives would improve elk habitat capability and may contribute to stabilization or an increase in Forest-wide population trend.

White-tailed Deer *(Odocoileus virginianus)*

White-tail deer inhabit a variety of forest types and other habitats including grasslands, agricultural lands, deserts, swamps, and urban settings (Higgins et al. 2000). In the Black Hills, open stands and grasslands are utilized for forage. Dense pine stands are used for winter cover and escape cover during hunting seasons. Spruce and aspen stands are used for summer thermal and hiding cover. Results from a Black Hills deer study (Kennedy 1992) showed that aspen stands are highly selected during fawning season. Abundant forage on the summer range can help the deer enter the winter

months in better condition. Prescribed burning and reduction of the timber canopy increase forage and browse production (Alexander 1987, Uresk and Severson 1989), but may do so at the expense of cover.

Optimal summer forage areas for white-tail deer in the Project Area includes wet and dry meadows, aspen (all stages), and open spruce and pine (1, 2, 3A, and 4A). Summer cover is pine (structural stages 3C and 4C) and spruce (3B, 3C, 4B, 4C, and 5). Optimal winter habitat is pine (3C, 4C, and 5) for cover, and meadows, aspen (2 and 3A), and pine (1) for forage.

Direct and Indirect Effects on White-tailed Deer

The Research-Rochford Project Area is considered deer and elk summer range as cooperatively mapped by a joint initiative of the Rocky Mountain Elk Foundation, SDGF&P, and the Black Hills National Forest (Rocky Mountain Elk Foundation 2002). The 2002 BHNF monitoring report indicates white-tailed deer populations have increased over the past five years, population growth is not currently being limited by habitat, and the Forest is meeting Objectives 217 and 221 (USDA 2004b).

Table 9 shows habitat effectiveness by alternative and season for deer in management area 5.1. There are no habitat effectiveness guidelines for management area 5.3A.

Season	Alternative A	Alternative B	Alternative C	Guideline (Minimum)
Summer	.38	.42	.46	.40
Winter	.32	.44	.45	.35

Table 9 displays overall habitat values for management area 5.1. Individual forage, cover, and distribution values are documented in the project file

Table 9. Habitat Effectiveness for Deer, MA 5.1

As shown above, both summer and winter habitat capability would remain below Revised Forest Plan guidelines under Alternative A. Summer values would probably continue to decline as pine growth continues to reduce herbaceous vegetation production. Under both action alternatives, both summer and winter habitat capability is increased, probably due to the increased number of year-long road closures. The area is principally summer range for white-tailed deer and few deer remain in the Project Area during winter (SDGF&P 2004).

Cumulative Effects on White-tailed Deer

Black Hills National Forest white-tailed deer populations increased approximately 16% between 1998 and 2002 (USDA 2004b). The same source indicates habitat is not the limiting factor for deer herds in the Black Hills. Loss of traditional winter range to development has likely had the greatest impact. Hunting is regulated by the State game agencies, but an unknown level of poaching occurs. Fawn mortality can be influenced by a wide range of factors. Regenerating aspen is very important to does during fawning; this habitat has increased since the mid-1980s, and both action alternatives would continue this trend. There are no known activities, future or ongoing, on private land, that would have a negative cumulative effect on habitat capability for white-tailed deer. Timber sales on private land would reduce cover values but would increase feeding values and the effects would be cumulative to proposed activities if they occurred. Private land that is subdivided would reduce habitat capability by reducing

forage and increasing vehicle traffic. The action alternatives would improve white-tailed deer habitat capability and may positively affect Forest-wide viability and population trend.

Migratory Birds

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines and other factors. The BHNF recognizes the ecological and economic importance of birds, and approaches bird conservation at several levels by implementing: (1) Revised Forest Plan objectives, standards and guidelines, (2) a Forest-wide bird monitoring program, and (3) site-specific mitigation and effects analyses for identified species of concern.

A variety of Revised Forest Plan objectives, standards and guidelines further the conservation of migratory birds. Objectives describe desired resource conditions. The most relevant objectives for bird conservation are those relating to vegetation diversity, landscape structural diversity, snags and down woody material, riparian condition, habitat improvements, and disturbance processes (see Revised Forest Plan objectives 201-232). Standards and guidelines are designed to help achieve those objectives, and are implemented at the project-level. The most relevant standards and guidelines to migratory birds are 2101-2109 (Forested Landscapes), 2201-2208 (Hardwoods and Shrubs), 2301-2308 (Snags and Down Woody Material), 2505-2508 (Proper Use or Residual Levels - Riparian/Uplands), 3101-3115 (Endangered, Threatened or Sensitive Species Protection and Management), and 3202-3212 (General Fish and Wildlife Direction).

Bird monitoring is conducted at the Forest level to determine species distribution, abundance, and trend (Panjabi 2001, 2003, 2004). The monitoring is designed and conducted by the Rocky Mountain Bird Observatory to provide statistically rigorous population trend data for at least 61 species that breed in the Black Hills. Trend data would assist the Forest in determining whether additional conservation measures are necessary.

Species of concern applicable to project-level conservation are identified by many sources, including the Endangered Species Act, the Regional Forester's sensitive species list, the BHNF MIS list, internal and public scoping efforts, and the US Fish and Wildlife Service's Birds of Conservation Concern (BCC) 2002 publication (FWS 2002a). All of these sources and their respective species of concern, except the BCC, have been examined elsewhere in this document.

The BCC 2002 publication partitions North America into 37 bird conservation regions (BCRs). The Black Hills is included in BCR 17 - Badlands and Prairies. Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's Sensitive Species list, and are evaluated in the Biological Evaluation if they have potential to occur in the Black Hills. Eight species are not expected to occur in the Black Hills due to lack of habitat. A summary account of these 19 species can be found in the wildlife report in the project file. The remaining five species or their habitats have potential to occur in the Black Hills, but only the golden eagle, black-billed cuckoo and the red-naped sapsucker or their habitat have the potential to occur in the Research-Rochford Project Area. Anticipated effects are evaluated below.

Golden Eagle (*Aquila chrysaetos*)
This species is a cliff and tree nesting bird that inhabits open country such as prairies, steep canyons, and savannas (Terres 1987). Contiguously forested habitats, such as those found within most of the Research-Rochford Project Area, are not preferred by golden eagles, but they may be included in a home range if suitable nesting or foraging habitat is interspersed. The Project Area contains no substantial cliffs or rock faces that provide typical nesting substrates. Eagles could forage within the larger meadows of the Project Area, or in adjacent grasslands and burned forest, but none have been detected during recent bird monitoring efforts (Panjabi 2001, 2003, 2004). Meadow restoration treatments proposed in the project would have a negligible positive effect on potential foraging habitat due to the small extent of the treatments that would enhance open conditions. No other vegetation treatments or access proposals would have any effect on the eagle or its habitat.

Red-naped sapsucker (*Sphyrapicus nuchalis*)
This species is associated with aspen groves and mixed pine/aspen (Tallman et al. 2002). The Research-Rochford Project Area contains 497 acres of aspen and many smaller mixed pine/aspen stands. Both action alternatives include aspen enhancements and would increase aspen by 42 acres (Alternative B) and 29 acres (Alternative C), satisfying Revised Forest Plan objectives 201 and 218 and guidelines 2201 and 2204 (both treated as standards) and 2205. The Rocky Mountain Bird Observatory documented 389 red-naped sapsuckers in 2001, 222 in 2002, and 245 in 2003 (Panjabi 2004). This baseline data indicates populations are probably stable Forestwide. One red-naped sapsucker was documented in the Project Area in 2003 along transect MR23. Meeting Revised Forest Plan objectives and following standards, guidelines, should increase suitable habitat for the red-naped sapsucker and ensure species viability Forestwide.

Black-billed Cuckoo (*Coccyzus erythropthalmus*)
This species breeds in deciduous woodland with shrubby vegetation, along shelterbelts, dense thickets, and near streams (Baicich 1997). Tallman et al. (2002) report that it is an uncommon migrant and summer resident and can be found in woodlands. Analysis of the Project Area shows there are approximately 2,116 acres of structural stages 1 and 2 habitat along riparian areas. None of the alternatives proposes treatments in riparian areas. Rocky Mountain Bird Observatory monitoring recorded two observations of the black-billed cuckoo in 2001 (Panjabi 2001), supporting Tallman's assertion that this bird is an uncommon migrant and summer resident. There are no other reported occurrences of this species in the Project Area or in other district records. One observation was recorded along RMBO transect RI19 approximately six miles north of the Project Area. The second observation was recorded 1.5 miles west of the Project Area boundary along RMBO transect WM24. None of the proposed activities would have an effect on black-billed cuckoo habitat or species viability in the Project Area or across the Forest.

3.3.2 Effects on Fish

Fish Habitat

Perennial streams within the project area include North Fork Rapid Creek, Rapid Creek, Silver Creek, Gimlet Creek, East Gimlet Creek, Jim Creek, South/Middle/North Boxelder creeks, and Corral Creek. An intermediate reach of Bloody Gulch has

permanent water. Private land ownership tends to be linear along streams and comprises a large percentage of the riparian corridor.

The project area includes only a small part of the North Fork Rapid Creek watershed.

Rapid Creek is a highly valued recreational trout fishery. A Walk-in Fishery located approximately 3 miles downstream of the project area extends from near Canyon City downstream to Silver City. Pactola Dam impounds Rapid Creek downstream of Silver City.

Silver Creek is a tributary of Rapid Creek. Portions of the stream have excellent riparian cover and other reaches are devoid of streamside vegetation due to grazing (SDGF&P 1995). No regular fish stocking is done on Silver Creek.

Gimlet Creek and East Gimlet Creek are wholly under Forest Service management. Habitat conditions near the confluence with East Gimlet Creek were characterized as having excellent riparian cover, adequate pool depth and instream cover (SDGF&P 1995).

Jim Creek has its headwaters in the Black Hills Experimental Forest and it flows eastward out of the project area. This creek delineates part of the project boundary and the majority of the streamcourse is in private ownership within the analysis area.

South Boxelder Creek has its origin on National Forest System lands, including the Black Hills Experimental Forest. The stream corridor is under private ownership in the remainder of the project area. Middle Boxelder Creek is entirely under private ownership within the project boundary.

North Boxelder Creek flows easterly through the project area for approximately two miles. Landownership within the project boundary is alternates between federal and private ownership.

Hay Creek is outside of the project boundary but portions of its watershed are within the project area where treatments are proposed. The stream is located in open pasture its entire length and due to grazing there is little riparian habitat (SDGF&P 1995). There is sedimentation in some areas due to land use practices and natural erosion (SDGF&P 1995).

Data on occurrence of fish species in the project area are from reports by the SDGF&P, BHNF records, and other pertinent scientific information. Native fish species documented in the project area include white sucker, mountain sucker, longnose dace and creek chub. Mountain sucker is a Region 2 sensitive species. Non-native fish species include brook trout, brown trout, and rainbow trout. In the past, cutthroat trout were also stocked in Upper Rapid Creek. Other incidental species include yellow perch.

The SDGF&P's management of Black Hills trout streams recognizes two management categories: "wild trout - natural yield" and "hatchery supplemented". Hatchery supplementation is more frequently used to maintain or improve brown trout and rainbow trout populations, whereas brook trout populations are typically sustained under the wild trout - natural yield option. The SDGF&P further classifies trout streams according to species (brook, brown, or rainbow trout) and the number of fish per acre greater than eight inches in length (SDGF&P 1993b).

The perennial streams, current trout stream classification and fish species in the project area are summarized in Table 10. The Hydrology and Soils report has additional information on watershed characteristics and condition.

Stream Name	SDGFP Stream Classification	Average Width (m)	Fish Species Present
North Fork Rapid Cr.	BNT2	3.0	Longnose dace, brown trout, mountain sucker, white sucker
Rapid Creek	BNT2/RBT3	5.1 – 8.9	Brown trout, rainbow trout, longnose dace, white sucker, creek chub, mountain sucker,
Silver Creek	BKT3/BNT2	1.2	Brook trout, brown trout
Gimlet Creek	BKT2/BNT2	1.1	Brook trout, brown trout
East Gimlet Creek	BNT2	0.9	Brown trout
Jim Creek	BKT2	1.5	Brook trout, longnose dace, mountain sucker, white sucker
Boxelder	BKT2/BNT2	3.5	Brook trout, brown trout, longnose dace, white sucker, mountain sucker
South Boxelder Cr.	BKT1	2.0	Brook trout, longnose dace, white sucker
Middle Boxelder Cr.	BKT2	3.0	Brook trout, longnose dace
North Boxelder Cr.	BKT2	1.4	Brook trout, longnose dace, mountain sucker
Corral Creek	BKT1	0.7	Brook trout, longnose dace, white sucker
Hay Creek	BKT2	0.9 – 1.6	Brook trout, longnose dace, yellow perch

BKT = brook trout
BNT = brown trout
RBT = rainbow trout
1 = # of trout ≥8-inch exceeds 150/acre
2 = # of trout ≥8-inch is between 25 and 150/acre
3 = # of trout ≥8-inch is less than 25/acre

Table 10. Perennial Streams, SDGFP Trout Stream Classification, and Fish Species Present

There are no natural lakes in the Black Hills (Stewart and Thilenius 1964). Several created impoundments exist upstream or downstream of the project boundary. The most substantial is Pactola Reservoir (Rapid Creek). Roubaix Lake (Middle Boxelder Creek) and Reausaw Lake (Hay Creek) are the other two. None of these dams allow upstream passage of fish.

Sensitive Fish Species

Mountain Sucker *(Catostomus platyrhynchus)*

Mountain sucker populations in the Black Hills are the eastern-most extension of the species. It occurs most often in cool, clear mountain streams with moderate water velocities. Stream substrate associated with mountain sucker habitat varies widely and ranges from mud to sand, gravel, and boulders, although cobbles are most common. This species is found on the stream bottom and is closely associated with cover (exposed roots, undercut banks, log jams and boulders). Mountain suckers are benthic feeders and their diet is primarily simple plants like diatoms and green algae, but small invertebrates are also ingested. Spawning occurs in the spring and a short migration may be made to spawning areas.

Historic surveys indicate the mountain sucker was widely distributed across the Black Hills (Evermann and Cox 1986, Bailey and Allum 1962, Stewart and Thilenius 1964). Recent surveys suggest that mountain sucker occurs in many of its historic drainages throughout the Black Hills (Isaak et al. 2003), but localized population reductions may have occurred.

Direct and Indirect Effects on Mountain Sucker

The No Action Alternative would maintain existing aquatic conditions and have no new effects on mountain sucker, though roads currently contributing sediment to the drainage system would continue to do so. Timber harvest and associated activities proposed under the action alternatives would have no direct effect on fisheries because no in-stream activities are proposed. Water temperature and stream-bank stability would be maintained because no streamside vegetation would be removed within the water influence zone. Fisheries habitat would be maintained because no instream large woody material would be removed.

Roads can often concentrate and divert surface water runoff and are a potential source of sediment that may affect water quality. The proposed new road construction identified in the action alternatives would be located over 170 feet from the nearest stream, thus providing an adequate vegetative buffer to filter out sediments. In addition, the hydrology mitigation measures identified in the Section 2.1.5 would mitigate other water quality concerns associated with the action alternatives.

Under both action alternatives, prescribed burning would occur along an approximately two-mile reach near the headwaters of South Boxelder Creek. This would remove the vegetation and could increase sediment input into the stream. Sediment input would depend on the intensity and frequency of rain events that mobilize and transport sediment due to surface water runoff into the creek. This would be a short-term effect on mountain sucker habitat, assuming vegetation reestablishes within the first post-burn year.

Cumulative Effects on Mountain Sucker

Previous management activities that have affected mountain sucker habitat include livestock grazing in riparian zones and sediment production from roads, mining, and other ground-disturbing activities.

Isaak et al. (2003) state that the wide distribution and abundance of the mountain sucker in the Black Hills, even after more than a century of intensive land use and introduction of several non-native predators, suggests the current risks for this species are minimal. As a result, land uses and attendant impacts to stream habitats would probably have to deviate strongly and on a forest-wide scale from historic and current norms before the existence of mountain sucker populations in the Black Hills would be jeopardized.

Management to provide non-native recreational fisheries may affect mountain sucker populations. Isaak et al. (2003) believed predation might be a plausible mechanism by which brown trout and brook trout may be impacting the mountain sucker. The action alternatives do not increase the frequency or number of non-native fish stocked in the project area. Implementation of Forest Plan Standards and Guidelines to maintain stream health for the mountain sucker also maintain habitat conditions for non-native species, subsequently maintaining at least the current level of interaction between native and non-native fish species. Under the No Action Alternative, roads and disturbed

areas that currently contribute sediment to the drainage system would continue to do so, but the cumulative effect would not increase. Under the action alternatives, cumulative impacts are associated with the incremental increase in sediments resulting from road construction/ reconstruction and prescribed burning. This would add to ongoing sedimentation from existing connected disturbed areas, livestock grazing on private and federal lands, and natural erosion. Closure and decommissioning of roads proposed under both action alternatives would decrease sediment transport and reduce the overall cumulative effect on brook trout habitat. Proposed construction of roads, skid trails, and log landings could increase the cumulative effect of sedimentation; because Alternative B includes road construction, the chances of noticeable cumulative effects on mountain sucker habitat would be greater. Under both alternatives, however, implementation of BMPs and WCPs would minimize sediment transport. Road construction, prescribed burning, and harvest activities would be distributed in time and space over at least five years and two unconnected drainages, i.e. Rapid Creek and Boxelder Creek. Due to these factors, the incremental change in cumulative effects under any alternative is expected to be negligible. None of the alternatives is expected to jeopardize populations of or habitat for mountain sucker in the Black Hills.

Determination
The proposed action and alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Proposed road construction/reconstruction and prescribed burning may contribute sediment into streams, while road closures may reduce sediment delivery. This may indirectly impact mountain sucker foraging and/or reproduction. The effects associated with this project would not jeopardize the existence of mountain sucker populations in the Black Hills.

Fish Management Indicator Species

Refer to page 56 for a general discussion of MIS.

Fish MIS that occur in the Project Area and may be affected by the project include the brook trout, brown trout and mountain sucker. Instream Fisheries Habitat was also designated as an MIS habitat component to be used as an ecological indicator and is incorporated through the fish MIS analysis.

Fish species not selected for MIS analysis include the finescale dace and lake chub. They were not selected because they are not found in or near the Project Area.

Brook Trout *(Salvelinus fontinalis)*
Brook trout are an important game species and are not native to the Black Hills. They need cold, clean headwater streams and lakes. Brook trout management promotes natural reproduction in the wild versus hatchery supplementation. They are sensitive to water temperatures above 20°C for extended periods of time and degraded water quality, including low pH, low dissolved oxygen, and sedimentation. Brook trout spawn in the fall. The eggs are susceptible to mortality from sediment.

The SDGFP classifies trout streams according to species. Streams within the Project Area classified as brook trout streams include Silver Creek, Gimlet Creek, Jim Creek, Boxelder Creek, South Boxelder Creek, Middle Boxelder Creek, North Boxelder Creek, Corral Creek and Hay Creek (SDGFP 1993b). These streams all provide recreational

fishing opportunities for brook trout. Minimal stocking of brook trout populations occurs.

Direct and Indirect Effects on Brook Trout
No activities would occur under the No Action Alternative, and this alternative would continue to achieve fisheries-related objectives identified in Forest Plan Goal 2 that are intended to maintain and conserve aquatic habitat conditions. Alternatives B and C would contribute to Revised Forest Plan objectives 217, 219, and 221, intended to maintain and conserve aquatic habitat conditions. Activities that may impact water quality are avoided or minimized through the implementation of standards and guidelines and BMPs. Unavoidable effects from prescribed burning and road construction or reconstruction are localized or short-term in nature. The action alternatives have the potential to improve aquatic habitat conditions by eliminating connected disturbed areas, primarily through road decommissioning, that may be sediment sources in the project area.

Cumulative Effects on Brook Trout
Brook trout, brown trout, mountain sucker and instream fisheries habitat are all similarly affected by the proposed activities. See cumulative effects discussion for mountain sucker, page 68.

Brown Trout *(Salmo trutta)*
Brown trout are an important game species and are not native to the Black Hills. Some stocking occurs but they also reproduce naturally. They prefer clear, cold stream headwaters and lakes, although they can survive in deeper, warmer, slower waters than other trout. Temperatures of 22°- 28°C are lethal and non-turbid waters are required for egg survival. Spawning occurs in the fall. Management activities that cause changes in brown trout habitat include livestock grazing in riparian zones, channelization and sediment from roads and other ground-disturbing activities.

Streams within the Project Area classified as brown trout streams include North Fork Rapid Creek, Rapid Creek, Silver Creek, Gimlet Creek, East Gimlet Creek, and Boxelder Creek (SDGFP 1993b). These streams all provide recreational fishing opportunities. Hatchery supplementation is frequently used to maintain or improve brown trout populations. Hatchery brown trout are stocked in Rapid Creek within the project area. Approximately 2,500 catchable brown trout were scheduled for release in 1993 (SDGFP 1993a).

Direct and Indirect Effects on Brown Trout
See the above effects discussion for brook trout. Both species occupy similar habitat and effects are similar for both species.

Cumulative Effects on Brown Trout
Brook trout, brown trout, mountain sucker and instream fisheries habitat are all similarly affected by the proposed activities. See cumulative effects discussion for mountain sucker, page 68.

3.3.3 Effects on Special Plants

All Region 2 sensitive plant species occurring in the BHNF were considered in this analysis. Habitat exists in the Research-Rochford Project Area for several Region 2 sensitive plant species known to occur within the Black Hills. Table 11 identifies

whether the species has been recorded in the Project Area or if there is suitable habitat for the species within the Project Area. Those species that have been recorded or have suitable habitat in the Project Area are discussed in detail following the table. A complete list of Forest Service Region 2 sensitive plant species that may occur in the Black Hills is available in the botany Biological Evaluation, located in the project record.

Common Name	Scientific Name	Species recorded in project area	Suitable habitat in project area
Small-flowered Columbine	*Aquilegia brevistyla*	X	X
Narrowleaf Grapefern	*Botrychium lineare*		X
Leathery Grapefern	*Botrychium multifidum*		X
Fox-tail Sedge	*Carex alopecoidea*		X
Bristleystalked Sedge	*Carex leptalea*		X
Yellow Lady's-slipper	*Cypripedium parviflorum*		
Trailing Clubmoss	*Lycopodium complanatum*		X
Large Round-leaf Orchid	*Platanthera orbiculata*		X
Sage Willow	*Salix candida*		X
Autumn Willow	*Salix serissima*		X
Highbush Cranberry	*Viburnum opulus* var. *americanum*	X	X

Table 11. Sensitive plant species recorded or with suitable habitat in the project area

Sensitive Plant Species Known to Exist in the Project Area

Small-flowered Columbine *(Aquilegia brevistyla)*

In the Project Area, as well as other areas in the Black Hills, small-flowered columbine is found in a variety of habitats, including spruce forest, mesic drainage bottoms, dry streambeds, and moist limestone cliffs. It is usually found on northerly aspects, but can occur on any aspect that allows for the proper moisture and light requirements (USDA 2003b).

Direct Effects on Small-flowered Columbine

No proposed treatments are located in known or potential habitat for this species and none of the alternatives would directly affect the species. Additionally, moist soils and riparian areas are protected during timber harvest and road-building on National Forest land under the WCPs and BMPs (See mitigation in Chapter 2, Section 2.1.5).

Indirect Effects on Small-flowered Columbine

Alternative A would have no indirect effects on small-flowered columbine.
Mechanized logging, effects of prescribed fire, and road building and reconditioning can contribute to soil disturbance and the spread of invasive species. Invasive species, including noxious weeds, have the ability to out-compete desired plants, and spray from herbicides that is used to help control weeds can also have negative effects on sensitive plants. With mitigation (Chapter 2, Section 2.1.5) designed to prevent or minimize soil disturbance and spread of invasive species, the action alternatives would have no more than a negligible effect on this species.

Cumulative Effects on Small-flowered Columbine

Soil disturbance, introduction of invasive species, and increased fuel loading, can negatively affect sensitive plant species and their habitat. Historical management activities in the Black Hills, including livestock grazing, road building, recreation, fire

suppression, mining activities, water diversion, and near-extirpation of beaver have created changes in high-probability plant habitat, all of which have decreased suitability of many areas as habitat for sensitive plant species.

Alternative A would continue to increase fuel loading and the cumulative effects associated with the suppression of fire. Lack of fire is likely to increase fuel loading, thus potentially intensifying wildfire susceptibility and behavior. Moist areas, including high-probability sensitive plant habitat, normally would not burn or would burn at low intensities; with excessive fuel loading, these areas could ignite and burn at unusually high temperatures. This could result in a loss of plant habitat or plant populations. Alternatives B and C both involve activities that would result in less fuel loading effects, but the activities would also increase the potential for the invasion of noxious weeds. The incremental change in cumulative effects under any alternative would be negligible.

Determination
The risk of adverse effects is low, since no populations of small-flowered columbine are known to exist in any proposed treatment areas and all high-probability sensitive plant habitat would be avoided under both action alternatives. In addition, BMPs and WCPs apply to the proposal. Consequently, the proposed action and alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Highbush cranberry (*Viburnum opulus* var. *americanum*)
In the Black Hills, highbush cranberry is found occasionally in wet, often shaded habitats along streams, springs, and canyon bottoms at middle elevations of the northern Black Hills (Larson and Johnson 1999). It grows in wet woods, along streams, and on moist wooded hillsides, requiring moist but well-drained sites for best development (USDA 2002b). The BHNF Plant Database (December 2003) shows the large majority of occurrences are in drainage bottoms or on low slopes with dry-mesic to moist soil conditions and partial shading. Elevations range from 3,800 to 5,700 feet. This species usually occurs in paper birch/ironwood (*Betula papyrifera/Ostrya virginiana)* and birch/hazelnut (*Betula papyrifera/Corylus cornuta)* community types, with or without spruce (*Picea glauca)* or aspen (*Populus tremuloides).* A few occurrences are in pine/oak (*Pinus ponderosa/Quercus macrocarpa).* Paper birch is present at almost all known sites.

Direct Effects on Highbush Cranberry
No proposed treatments are located in known or potential habitat for this species and none of the alternatives would directly affect the species. See above discussion for the small-flowered columbine. The riparian and/or moist forest sites occupied by this species are protected by the WCPs and BMPs.

Indirect Effects on Highbush Cranberry
There would be no indirect effects on highbush cranberry under Alternative A. Indirect effects under Alternatives B and C would include those associated with noxious weed invasion, as discussed above for the small-flowered columbine. With mitigation (Chapter 2, Section 2.1.5) designed to prevent or minimize soil disturbance and spread of invasive species, the action alternatives would have no more than a negligible effect on this species.

Cumulative Effects on Highbush Cranberry
See cumulative effects discussion for small-flowered columbine. The riparian and moist forest sites occupied by highbush cranberry is similar to the habitat of small-flowered columbine, and the cumulative impacts would be the same.

Determination
The risk of adverse effects is low, because no populations of highbush cranberry are known to exist in any proposed treatment areas and all high probability sensitive plant habitat would be avoided under both action alternatives. In addition, BMPS and WCPs apply to the proposal. Consequently, the proposed action and alternatives may adversely impact individuals, but would not be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Sensitive Plant Species With Habitat in the Project Area

The following species have not been found in the Project Area, but suitable habitat is known to exist.

- Leathery grapefern (*Botrychium multifidum*)
- Fox-tail sedge (*Carex alopecoidea)*
- Bristleystalked sedge (*Carex leptalea*)
- Yellow lady's slipper (*Cypripedium parviflorum)*
- Trailing clubmoss (*Lycopodium complanatum)*
- Large round-leaf orchid (*Platanthera orbiculata)*
- Sage willow (*Salix candida)*
- Autumn willow (*Salix serissima)*

In the Black Hills, the primary habitat for the eight species listed above is riparian communities and/or moist forested communities, usually with a birch or spruce component. Although the Research-Rochford Project Area has suitable habitat for the species listed above, none of them have been found within the project boundary. The analysis focuses on effects on the habitat of the identified species.

Direct Effects on Eight Identified Sensitive Plant Species
Because alternative A does not involve any treatments or road proposals, it would have no direct or indirect effects on sensitive plant species or their habitats. Alternative A would maintain sensitive plant species habitat and protect biodiversity in the short term.

Alternatives B and C both involve similar direct effects on sensitive plants. The harvest treatments proposed under both alternatives would avoid known sensitive plant habitat. In addition, moist soils and riparian areas are avoided under the BMPs and WCPs. Construction of new road #205 under Alternative B would take place close to sensitive plant habitat, and mitigation identified in Chapter 2 is designed to ensure the new construction does not affect this habitat. No other proposed road construction associated with either alternative is located near sensitive plant habitat. None of the proposed fuels treatments are in sensitive plant habitat.

Indirect Effects on Eight Identified Sensitive Plant Species
Alternative A would have no indirect effects on sensitive plant species. Alternatives B and C both involve removing pine during proposed vegetative harvest and fuel treatments in the Project Area. There could be a small increase water yield as a result,

but any change is likely to be immeasurably small and transient. This could have a negative or positive effect on sensitive plant habitat depending on the magnitude and location of the treatment. It is possible that an increase in available moisture would improve and/or expand sensitive plant habitat.

A negative indirect effect that could be associated with both action alternatives is new weed infestations associated with ground disturbance caused by logging and prescribed burning (see above discussion under small-flowered columbine). Increased livestock accessibility and forage availability in treated stands could facilitate spread of weed seeds and create a greater susceptibility for noxious weed infestations. In addition, increased cattle use into previously inaccessible areas could lead to additional mechanical disturbance (trampling) of habitat. Increased mechanical disturbance and the spread of weeds could cause a decline in sensitive plant habitat suitability.

Cumulative Effects on Eight Identified Sensitive Plant Species
See above cumulative effects discussion under small-flowered columbine and highbush cranberry. The riparian and moist forest sites occupied by these eight identified plant species is similar to the habitat of the small-flowered columbine and highbush cranberry, and the cumulative impacts would be the same.

Determination
Alternative A would not have any direct or indirect effects on sensitive plants or their habitat. The probability of negative effects on sensitive plants and their habitat would be low under Alternatives B and C since, with mitigation, there are no known sensitive plant populations or high-quality plant habitat within proposed treatment or road proposals. Therefore, all alternatives may adversely impact individuals, but none would be likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for the eight analyzed species.

Sensitive Plant Species With Possible Suitable Habitat, No Known Occurrences

A Region 2 Sensitive plant species, narrowleaf grapefern (*Botrychium lineare),* was determined in December 2003 to occur in Dugout Gulch, approximately seven miles south of the town of Beulah in the Black Hills of Wyoming. No occurrences are known in South Dakota or in the Research-Rochford Project Area. Because this species had not been documented to occur within the Black Hills until very recently, this document does not tier to any BHNF programmatic level documents. In November 2003, an assessment for three *Botrychium* species within USFS Region 2 (Beatty et al. 2003), including *Botrychium lineare,* was completed and this analysis references that document.

Historical and current occurrences of narrowleaf grapefern have been documented in Idaho, Oregon, Montana, California, Washington and Colorado, and in Quebec and New Brunswick, Canada (FWS 2002b). Based on new occurrence information (2003 and 2004) and continued herbarium searches of historic vouchers, the species is also now documented from Utah, Wyoming (Black Hills occurrence), Alaska, and the Yukon Territory. New additional occurrences have been found in Glacier National Park, Montana (Farrar 2004). Refer to the project file for further information on rangewide distribution and status.

Typically, moonworts such as this species are long-lived (i.e. 10-15 years), colonizing plants that may require disturbed sites to become established (Don Farrar personal communication 1996, 2003, 2004). This is consistent with the narrowleaf grapefern occurrence conditions at the single known Black Hills site, which is on an old, native-surface roadbed and experiences ongoing low-level disturbance. Refer to the Regional assessment (Beatty et al. 2003) for a full narrowleaf grapefern description.

Typical habitat descriptions for narrowleaf grapefern are problematic because known sites are so different across its currently known range (Beatty et al. 2003). This species may be a habitat generalist since habitat across the range for narrowleaf grapefern is quite variable and its range stretches from sea level in Quebec to approximately 10,000 feet in Colorado. Narrowleaf grapefern has been observed growing in primarily open habitats and often in areas with documented disturbances, both human-caused and natural (Farrar 2004).

Baseline inventory documentation of the narrowleaf grapefern occurrence on the Black Hills shows habitat similarities to as well as differences from occurrences elsewhere. The Black Hills occurrence is dominated by grasses and forbs. The lower slopes immediately adjacent to the roadbed are dominated by paper birch and bur oak with a thick shrub layer of hazelnut (USDA 2003c). Refer to the project file for further information on habitat.

Determination
Because of the uncertainties and limited information for this species in the Black Hills and in the Rocky Mountain Region, it is difficult to assess whether Alternatives A, B, and C for the Research-Rochford Project Area would have no effect, a potential adverse effect or a potential beneficial effect on narrowleaf grapefern. Based on the information that is available, a determination of "May adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing" (USDA 2003c) is made for narrowleaf grapefern. Refer to the project file for more information on the above determination.

State-listed Species

State-listed plant species found in the Project Area include marsh muhly (*Muhlenbergia glomerata)*, northern arnica (*Arnica lonchophylla* ssp. *arnoglossa)*, long-stalk sedge (*Carex pedunculata*), and cottongrass bulrush (*Scirpus cyperinus).*

There are eight known occurrences of northern arnica, six known occurrences of long-stalk sedge, and one known occurrence of cottongrass bulrush in the Project Area. None of these occurrences are in any areas proposed for treatment under the action alternatives and no direct or indirect effect on these plant species is anticipated.

There are five occurrences of marsh muhly in the Project Area. One of these occurrences is located in a harvest treatment that is proposed under both Alternatives B and C, while another occurrence in located in a treatment unit that is only proposed under Alternative B. Marsh muhly was originally believed to occupy only unique marshy habitats in the Black Hills. Because of the recent discovery of many locations of marsh muhly in fairly dry, open sites on the BHNF, a reduction in canopy cover is not expected to have a detrimental effect on the two populations within treatment units. Viability of this species on the Black Hills would not be affected.

Other Species of Concern

Other species of concern includes plant species that are documented or suspected to be at risk locally but which do not meet the criteria for USFS Region 2 sensitive species designation. Within the Project Area, there are two species of concern:

- Arrow-leaved sweet-coltsfoot (*Petasites sagittatus)*
- Downy gentian (*Gentiana puberulenta)*

There is also a species for which there is insufficient information to make a determination concerning its status as a species of concern:

- One-flower wintergreen (*Moneses uniflora)*

These species also appear on the State of South Dakota list, and have varying levels of concern and status.

Arrow-leaved sweet-coltsfoot occurs in or near two harvest treatment units identified under both action alternatives. Mitigation identified in Chapter 2 would prevent negative effects on this plant species. The occurrences of downy gentian and one-flower wintergreen are not located within any proposed treatment units under either action alternative. As a result, none of the alternatives are likely to have an effect on these species.

3.4 Soil and Water

This section summarizes the hydrologist's report (located in the project file), which contains data, research references and detailed analysis of effects on soil and water. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

The Project Area is located in parts of nine Hydrologic Unit Code (HUC) 7 watersheds as depicted in Table 12. The total acreage for all watersheds is about 72,350. Drainage channels in the area flow into Rapid Creek and Boxelder Creek, which flow east and northeast out of the Project Area. Rapid Creek flows downstream to Pactola Reservoir, a major recreational and water supply reservoir. See Figure 8.

Watershed Name	Watershed #	Major Drainages
Hay Creek	10120111010103	Hay Creek, Upper Boxelder Creek
North Boxelder	10120111010101	Corral Creek, North Boxelder Creek
Middle Boxelder	10120111010102	Roubaix Lake, Middle Boxelder Creek
South Boxelder	10120111010104	South Boxelder Creek
Nahant	10120110010103	North Fork of Rapid Creek
Rochford	10120110010301	Silver Creek, Rapid Creek, Smith Draw, Irish Gulch
Gimlet	10120110010302	Gimlet Creek, East Gimlet Creek
Jim Creek	10120111010203	Jim Creek
Minnesota Ridge	10120110010303	Rapid Creek, Bloody Gulch, Benner Gulch, Minnesota Gulch, Bearcat Gulch

Table 12 Watersheds Wholly or Partially Within the Project Area

3.4.1 Existing Watershed Conditions

Natural Watershed Conditions

The major soils in the Project Area include Hisega-Rock Outcrops, Rock Outcrop-Pactola, Pactola-Virkula-Rock Outcrop, Buska-Rock Outcrop, and Citadel, 10%-30% slopes. Minor soil units include Marshdale-Maitland, Virkula, Rock Outcrop-Pactola 25%-60% slopes, Maitland and Cordeston-Marshbrook. Some of these soils have moderate to very high erosion potential or potential for landslide activity, may be subject to slumping, or may be prone to compaction and rutting when wet. Existing soil conditions from past activities are at least 85% undisturbed in a similar analysis area (Nelson 2002).

The Research-Rochford watersheds contain some of the best surface flow conditions in the entire Black Hills. Streams in most of the main drainages are perennial as they flow through the crystalline core geology of the area. During field examination, perennial flow was observed in the channels listed in the table below.

Drainage Name	Watershed(s)	Approx. Flow Rate
Rapid Creek	Rochford, Minnesota Ridge	10-20 cfs*
North Fork Rapid Creek	Nahant	10 cfs
Silver Creek	Rochford	< 5 cfs
Bloody Gulch	Minnesota Ridge	< 1 cfs
Gimlet Creek	Gimlet	< 5 cfs
East Gimlet Creek	Gimlet	< 5 cfs
Jim Creek	Jim Creek	< 5 cfs
South Boxelder Creek	South Boxelder	< 1 cfs
Middle Boxelder Creek	Middle Boxelder	< 5 cfs
North Boxelder Creek	North Boxelder	< 5 cfs
Hay Creek	Hay Creek	< 5 cfs
Corral Creek	North Boxelder	< 5 cfs

*Cubic feet per second

Table 13. Perennial Stream Reaches within the Project Area

Most tributaries are dry, grassy and timbered draws that route water only during infrequent and intense run-off events. Most of these draws do not exhibit evidence of recent flow. They contain neither a defined channel nor channel scour exposing gravel or sand substrate.

Levels of sediment, temperature, pH, nutrients, and bacteria are within the thresholds of South Dakota water quality standards for all perennial streams in the Project Area, with the exception of some minor violations in Rapid Creek and Boxelder Creek (SDDENR 2002 p. 113-121). All perennial stream miles in the Project Area are reported as fully supporting designated beneficial uses in the 2002 South Dakota 305(b) Water Quality Assessment, prepared by the South Dakota Department of Natural Resources (SDDENR 2002 p. 113-121).

Watershed condition class determinations completed during revision of the Forest Plan indicate the overall health of North and Middle Boxelder, Hay Creek, and Nahant watersheds are of moderate concern. The remaining watersheds are of higher concern, indicating that management activities to improve the health of the watershed are necessary.

Stream health surveys were completed in 1996, 1997, 1998, and 2000 for Corral Creek, Boxelder Creek, Jim Creek, East Gimlet Creek, and Gimlet Creek. These surveys made estimates of stream channel substrate quality, stream bank vegetation amounts, and stable overhanging stream bank amounts. Corral Creek was determined to have "robust" stream health, while all others were determined to have "diminished" stream health (Macy 1999).

Floodplains within the analysis area are most affected by roads and their location with respect to drainages. Some road crossings can potentially affect water quality, change stream channel dynamics by constricting the floodplain, concentrate water flow and

velocity, and change stream gradient. Specific locations of concern are identified in the soil and water specialist report in the project file.

Most riparian ecosystems in the analysis area are associated with the perennial and intermittent stream channels in the area. Some ephemeral drainage bottoms and springs contain plants associated with riparian areas, but these areas are not continuous and are separated by open, dry meadows. Existing roads and cattle use affect the riparian areas in Bloody Gulch, Benner Gulch, and East Gimlet Creek. The location, size, and type of wetlands in the area are further described in "Wetlands in the Research-Rochford Analysis Area" (Tangenberg 2004e).

Constructed Watershed Features

An inventory of the existing condition of roads within the Project Area was completed in 1999 and 2002. Specific concerns with sediment, erosion, plugged culverts, inadequate drainage, poor location, and rutting were noted for several roads and are specifically described in the roads analysis for the project. These areas all contribute sediment and increase peak water flows from runoff.

Many springs in the Project Area have been developed to provide livestock water. Many springs are not fenced and meadows remain vulnerable to trampling and overuse, particularly during dry years. Livestock use often concentrates adjacent to fences, resulting in areas of bare, compacted earth. There is a stock dam in the upper portion of Gimlet Creek, at the northern end of NFSR 203.5. There are also some dams/ponds south of NFSR 198.1 in T3N, R4E, Sections 23, 26, and 27. These dams collect runoff and store water in small ponds.

3.4.2 Direct and Indirect Effects on Soil and Waters

Soil Erosion, Compaction, Heating, and Nutrient Loss

Alternative A identifies no new activities, but existing soil erosion concerns associated with roads would persist. Conditions may worsen without effective closures and decommissioning of damaged, unnecessary roadways. Absent the disturbance associated with the action alternatives, soil productivity and soil nutrients may improve over time. However, the risk of a catastrophic fire would increase; soil cohesion, soil productivity, and soil nutrients would be severely impacted if such an event were to occur.

Timber harvest and fuel treatment activities associated with the action alternatives can result in erosion, loss of soil nutrients, soil compaction, displacement, and furrowing. Sites where activities might contribute to erosion would be stabilized and maintained with erosion control measures in accordance with Revised Forest Plan standards, BMPs and WCPs. Additional mitigation measures, identified in Chapter 2,would be employed to further reduce effects to the soil resource. Timber harvest activities, including felling, skidding, decking, transporting of logs off-site, and slash disposal, can affect soil resources. Potential effects to soil resources include soil compaction, displacement, and furrowing. Soil erosion can occur when rainstorms occur on sites where the ground cover has been removed. Prescribed burning associated with the action alternatives would have little effect on soils, as burned areas generally recover in a year or two. While ground disturbance would occur during road decommissioning and road

construction, the decommissioned roads would no longer be sources of soil erosion once the road surfaces have revegetated. Over the long term, the road proposals would return more soil area to the productive soil base than they would remove.

Mass Movement

Landslides are not expected to occur under any alternative because of the relative scarcity of landslide features in the Project Area. Slumping may occur in areas where rock layers are parallel to the cutslope of roads, but would only affect the road, and would not pose a risk to downslope resources.

Streamflow Regime

Alternative A proposes no actions and would not affect water flow. In the absence of a catastrophic wildfire, existing vegetative growth would continue to slightly diminish water yield. The current road system provides a drainage system, which would remain under Alternative A. The existing road network creates higher peak flows than would exist without a road network and accelerates the timing of the flows.

Under both action alternatives, increases in flow volume resulting from timber harvest and vegetation management are not expected. Regeneration and accelerated growth of remaining vegetation would balance the water equation for the area. Some non-system roads that would be decommissioned would no longer contribute to higher runoff volumes and accelerated water delivery in the Rochford, Gimlet, and Minnesota Ridge watersheds. The broadcast burns and underburning associated with both alternatives could result in increased runoff and water flow volumes, but would have little effect on erosion or soil productivity.

The construction of new road # 209 under Alternative B would place a new road across the west fork of Bloody Gulch in the Minnesota Ridge watershed. In order to meet Revised Forest Plan standard 1112 and WCP standard 1(a), mitigation identified in Chapter 2 would take place in Bloody Gulch and Benner Gulch to prevent increased runoff in the watershed. Disturbed areas along NFSRs 184.1A and 231.2A and unclassified road RC 2X would be disconnected from downstream receiving waters so that accelerated runoff and sediment are not added to Rapid Creek. Alternative C would not involve the construction of this road and would not require the mitigation.

Water Quality

Under Alternative A, existing roads would continue to contribute sediment to the drainage network. The current conditions of temperature, dissolved oxygen (DO), and water purity would generally persist in the surface water and the existing minor violations of state water quality standards would continue. Unless prolonged drought causes streams to dry up, waters in this area would continue to support state-assigned beneficial uses.

By implementing the mitigation measures in Chapter 2 and BMPs, water quality and beneficial uses would not be negatively affected by either action alternative. Streams, springs, and some ephemeral draws would be buffered from activities with streamside management zones and vegetation buffers. Disturbed sites would be reseeded to prevent harmful runoff and sedimentation. Road decommissioning and rehabilitation efforts may contribute to short-term sediment increases to the drainage network. Stream

crossing improvement activities could also generate short-term increases in sediment. Neither action alternative is expected to have an effect on DO, pH, or water purity. Road decommissioning and watershed restoration projects would reduce some existing sediment, erosion, and water delivery problems.

Channel Morphology

Since there would be no new activities associated with Alternative A, there would be no new effects to stream morphology. Stream channels that are currently unstable would gradually stabilize over the next several decades. The effects of existing roads and road/stream crossings on channel morphology, increased water yield, sediment loads, elevated peak flows, and accelerated peak flow timing would continue.

Both action alternatives would have similar effects on channel morphology. Increases in flow volume and subsequent changes in stream morphology are not expected to result from the prescribed burning, fuel treatments, road proposals, and timber harvest planned in either action alternative. Proposed activities are not expected to change stream channel dynamics. Decommissioning of proposed road segments would reduce the higher runoff volumes and accelerated water delivery caused by the connected portions of the road network. These reductions would result in a more stable flow regime, and reduced risk of channel readjustment following flood events.

Floodplains

Alternative A would cause no new effects on floodplains. The effects of the existing road network on floodplains would continue.

Both action alternatives would have similar effects on floodplains. No new roads would be built on floodplains. Possible effects on floodplains from harvest activities, such as compaction/displacement of wet soils and location of slash piles, would be mitigated through application of BMPs. Some roads currently located in floodplains would be maintained, reconstructed, or decommissioned. This would generally improve the condition of floodplains in the Project Area by reducing flow concentration along roads. It would also improve conditions by reducing compaction and soil displacement.

Riparian Ecosystems

Alternative A would have no new impacts on riparian ecosystems. Existing impacts resulting from roads, grazing, and past harvest activities would persist, and conditions around Gimlet and West Gimlet Creeks may improve or worsen over time depending on management of grazing and off-road vehicle traffic.

Under the action alternatives, designation of protected stream courses and employment of appropriate design criteria would mitigate impacts from harvest activities. No new roads would be built in riparian ecosystems. Road decommissioning and associated riparian restoration activities may result in short-term impacts to riparian ecosystems, but long-term benefits of enhanced riparian conditions are expected.

Wetlands

Under Alternative A, wetlands in the area are expected to persist. They would remain vulnerable to existing roads, off-road vehicle traffic, and grazing.

The action alternatives propose some activities within units with wetlands. The integrity of these wetlands would be protected through application of BMPs and timber sale contract provisions. Decommissioning of roads may generate short-term effects in wetlands in the Gimlet and West Gimlet areas. However, long-term benefits are expected due to revegetation and repair of disturbed areas.

3.4.3 Cumulative Effects on Soil and Water

The cumulative effects area for soil and water is approximately 72,350 acres in size and involves the nine 7th level watersheds as depicted in Figure 8. Past, current, and reasonably foreseeable events in the cumulative effects area are discussed at the beginning of this chapter.

Alternative A would not add to cumulative effects.

The total acres of vegetative harvest that has occurred in the cumulative impacts analysis area during the last 10 years represents approximately 14% of the area. With application of BMPs, both of the action alternatives would result in total soil disturbance remaining under 15% and would maintain or improve water quality in the analysis area. Since water yields would be maintained, and channel integrity would be improved, channel morphology would also be expected to improve. Proposed activities would be spread out across the landscape and over a period of several years, resulting in effects that are well distributed both spatially and temporally. Considering the partial-cut nature of past and proposed timber harvest, cumulative effects resulting from the proposed harvest activities are less than the acreage total might indicate. This partial-cut method reduces the possibility of harvest-related mass movement events.

Vegetation treatments conducted using BMPs do not result in unacceptable watershed effects (Macy 1997 and USDA 2002a). Planned harvest and fuel reduction activities are of similar scale as past activities.

Under the action alternatives, roads would reconstructed, maintained, or decommissioned. In addition, under alternative B, 2.9 miles of new road would be constructed. These activities would result in short-term effects to soils and water flows in the analysis area. Roads and the road network have affected water flows in the analysis area. The use of BMPs during implementation of road proposals under either action alternative would not cause measurable cumulative effects to streamflow, water quality, or channel morphology. Long-term beneficial watershed effects are expected from maintenance and decommissioning of roads.

Disturbances to soils and watersheds from prescribed burning are not anticipated to persist for more than one season. Revegetation and freeze/thaw cycles break up small areas of bare earth or hydrophobic soils created by prescribed burning. Mechanical fuel treatments usually result in little soil disturbance.

Some land units within the analysis area currently have near 15% disturbance, primarily in association with livestock grazing. This includes areas along North, South, and Middle Boxelder Creeks. These areas are not directly affected by proposed vegetative harvest or fuel treatments, and none of the alternatives would add to the cumulative effect on these areas.

Off-road vehicle traffic contributes to the level of disturbance in the area. Traffic of this type increases the amount of bare, displaced soil and exposes this soil to erosive weather conditions. The level of this disturbance associated with this activity, combined with all other disturbance sources, appears to remain below the 15% threshold for land units in the analysis area. However, the level of disturbance from this use is not entirely known and would be monitored.

Vegetation treatments, roadwork, grazing, and off-road vehicle use would all occur under the action alternatives. Management of these activities using appropriate BMPs would not lead to unacceptable cumulative impacts on floodplains, wetlands, and riparian ecosystems.

3.5 Rangeland

This section summarizes the range specialist's report (located in the project file), which contains data, research references and detailed analysis of effects on the rangeland resource. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Plan direction.

The Research-Rochford Project Area encompasses five active grazing allotments. The Corral Creek Allotment currently runs 59 cow/calf pairs, the Boxelder allotment runs 154 cow/calf pairs, the Pasture allotment runs 125 cow/calf pairs, the East Rapid allotment runs 104 cow/calf pairs, and the Wolff allotment runs 364 cow/calf pairs. Season of use is during the months of June through October on all of the allotments.

3.5.1 Direct and Indirect Effects on Rangeland

Alternative A would have little effect on the range resource and would not change allotment management. Available primary forage would remain at the current level. Without the removal of the overstory associated with the proposed vegetative harvest treatments, the availability of secondary forage may gradually decrease. The shading effect provided by the overstory could inhibit the growth and reduce the availability of livestock forage species.

Both action alternatives would have limited effects on the range resource and would not be expected to change allotment management. For a few years after the vegetative harvest treatments, the removal of the timber overstory may increase the growth of grasses and forbs and provide additional secondary forage to livestock. Meadow and hardwood restoration projects using prescribed fire should also increase and improve the forage component, providing a benefit to the range resource.

Proposed fuel treatments associated with either action alternative comply with standard 4107 requiring deferment of livestock grazing for a portion or all of the following growing season to ensure re-growth of forage species. The allotments in which the proposed prescribed burning would take place are grazed under a deferred rotation system. The use of particular pastures would be coordinated with the burning activity to ensure that this standard is achieved and there is adequate re-growth of forage species.

Road proposals associated with any of the action alternatives would have no effect on the range resource. If access is needed for maintenance of range improvements, roads

could be temporarily opened. Improvements, including cattleguards, fences, spring developments, and water storage tanks, would be protected during proposed activities.

3.5.2 Cumulative Effects on Rangeland

Any negative effects on the rangeland resource from this project in combination with past, present or foreseeable future projects would be minimal. Meadow acreage has steadily decreased through time as a result of conifer encroachment and the proposed meadow enhancement treatments would work towards counteracting this effect.

3.6 Noxious Weeds

This section summarizes the range specialist's report (located in the project file), which contains data, research references and detailed analysis of effects on noxious weeds. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

Past ground-disturbing activities, including road construction and maintenance, logging, livestock grazing, and motor vehicle use, have resulted in the introduction and spread of noxious weeds in the Project Area. There are currently 70 acres of leafy spurge, 45 acres of yellow toadflax, and 362 acres of canada thistle mapped in the Project Area. Other weed species such as houndstongue and other species of thistle are scattered throughout the Project Area in varying degrees of density. Within the Project Area, over 477 acres of noxious weeds are currently scheduled for chemical and physical treatment (see project file for specific locations.)

3.6.1 Direct and Indirect Effects on Noxious Weeds

Alternative A proposes no new ground disturbing actions, but the ongoing uses would result in continuing noxious weed problems. Scheduled treatment to prevent spread would minimize this effect.

Under the action alternatives, the increase in ground-disturbing activities such as logging, road construction/maintenance, and increased traffic movement are anticipated to increase noxious weed infestations. The exposure of mineral soil as a result of these activities would provide a seed bed for noxious weed seed germination. This would result in displacement of native forbs and grasses with a minimal decrease in forage and browse production. Both action alternatives propose closing roads to motor vehicles, which would minimize new weed infestation in these areas. Alternative C identifies more road closures than Alternative B, and consequently would be anticipated to result in less noxious weed spread.

3.6.2 Cumulative Effects on Noxious Weeds

Noxious weeds arrived in the Black Hills via contaminated hay, livestock, vehicles, and many other vectors. Continued ground-disturbing actions and displacement of native vegetation within the Project Area, including the activities associated with this project, would increase the susceptibility of the area to noxious weed colonization. The mitigation identified in Chapter 2 is designed to minimize the spread of noxious weeds resulting from this project.

3.7 Scenery

This section summarizes the landscape architect's report (located in the project file), which contains data, research references and detailed analysis of effects on the scenery resource. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

The Project Area is forested with some rural-pastoral/agriculture areas dispersed throughout the area. Management of this area includes evidence of timber harvests, recreational uses, and grazing. Although these activities are occurring and have occurred in the past they are subtle and not visually dominant (USDA 1996 Appendix B-47 thru B-54). The majority of the area is consistent with a natural appearing landscape.

Fall color from aspen and other hardwoods is limited due to ponderosa pine encroachment. Meadows are being invaded by ponderosa pine and becoming forested sites. Hardwood shrubs appear to be limited as well. Overall, the ponderosa pine stands appear very dense. Where overstory trees are not present, or are limited, the understory is very dense. The few open meadows in the Project Area are primarily on private land, and the National Forest System lands are primarily forested.

The Project Area is bisected by U.S. Highway 385. This highway provides access for recreationists to Roubaix, Pactola, and Sheridan Campgrounds (USFS) and Custer Crossing Campground (private), as well as the communities of Custer, Rochford, Hill City, Lead, and Deadwood. Local landowners, permittees, contractors and recreationists travel throughout the Project Area. In addition, the Project Area is well traveled by hunters in the spring and fall. Major travel routes such as federal, state, and county roads have a high scenic integrity objective (SIO) in their foreground (the area within approximately one-half mile on each side of the highway), and a moderate SIO in the middleground (the area beyond the foreground, on each side of the highway, to a distance of four miles). When a landform blocks the visibility of an area from the foreground/middleground of the highway or another high use area, a low SIO is assigned.

3.7.1 Direct and Indirect Effects on Scenery

Under Alternative A, existing conditions and natural processes would continue. The forest would continue to grow more dense, becoming thicker and reducing visible open space. Wildfire suppression would continue and the natural role of fire on the landscape would be suppressed.

Both action alternatives involve vegetative treatments that would affect the scenic integrity of the area. Those treatments removing the most large trees would have the greatest effect. Other factors influencing the effect of the treatments include slope, aspect, soil disturbance, residual tree spacing, and slash clean up. Overstory removal treatments would have the largest effect on the scenic resource, since the prescription includes removing most large trees. Mitigation in Chapter 2 of this document is designed to ensure activities proposed under the action alternatives meet Scenic Integrity Objectives.

3.7.2 Cumulative Effects on Scenery

Past activities within the Project Area include vegetation treatments and construction of roads, trails, and utility corridors. However, many of these activities are not readily apparent from main highways and trails that traverse the area.

In general, the timber stand improvement treatments and commercial thinning treatments proposed under the action alternatives would result in a park-like condition with more mature, larger-diameter trees. This would be similar to a landscape where frequent, low-intensity surface fire has occurred. Overstory removal treatments would move the forest toward an open condition, with a young, densely-growing, understory.

The surrounding areas are expected to have similar types of vegetation treatment through similar methods. As pockets or units are treated across the forested landform, a mosaic of tree densities, and distribution, can be expected. Where large contiguous areas of overstory removals occur, the area would have Low Scenic Integrity. Where the landscape is dominated by commercial thins and hardwood restorations, the area would have a Moderate to High Scenic Integrity.

3.8 Recreation

This section summarizes the recreation specialist's report (located in the project file), which contains data, research references and detailed analysis of effects on the recreation resource. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

Numerous dispersed motorized and non-motorized recreational activities occur in the Project Area, including mountain biking, hiking, horseback riding, cross-country skiing, snowmobiling, berry picking, hunting, fishing, camping, off-highway vehicle use, motorcycling, and driving for pleasure. The George S. Mickelson trail is located in the southern portion of the analysis area and provides non-motorized recreation opportunities. It is most popular with mountain bikers, hikers, horseback riders and cross-country skiers. There is a very short section (1/4 mile) of snowmobile trail in the Project Area. Off-highway vehicle (OHV) use is popular in the analysis area, especially near the town of Rochford. There are no Forest Service developed recreation facilities in the Project Area.

There are approximately 143 miles of road in the Project Area open to motorized use year-round or seasonally.

3.8.1 Direct and Indirect Effects on Recreation

Under Alternative A, ongoing recreational pursuits would continue. There would be no effect on existing recreational use of the Project Area.

None of the proposed vegetative harvest units under either action alternative are located in close proximity to the Mickelson trail. Under both action alternatives, logging trucks would cross the Mickelson Trail on NFSR 184.1 to harvest four treatment areas located south of the town of Rochford. One proposed fuel treatment is located near the trail, but any impact to trails users would be short term and limited to a specific area.

There are no developed campgrounds or picnic grounds within the analysis area on National Forest System land. The Roubaix Campground (USFS) is located about ½ mile west of the analysis boundary. Project activities would not be visible to campground users and should not affect the recreational experience of users of the facility. The Custer Crossing Campground is located on private property within the analysis area. Mitigation developed to reduce the visual impact of vegetation treatments adjacent to major forest roads would limit the effect of the project on campground users. The Custer Crossing Campground also rents out snowmobiles and ATVs used by recreationists in the area; there would be no effects on snowmobile trails, but ATV riders accustomed to using Forest Service roads could find some additional roads closed or decommissioned. The majority of roads would remain open.

Under Alternative B, roads open year-round or seasonally would be reduced by approximately 30 miles. Under Alternative C, there would be approximately 59 fewer miles of road open year-round or seasonally. Alternatives B and C would have a direct effect on motorized recreation because both alternatives close and decommission roads. Closures may affect individual ATV users or motorcyclists who use the unimproved and improved roads, but sufficient roads would remain open to accommodate this use. Some of the roads proposed for closure under both alternatives are used for recreation events by local four-wheel drive clubs. The USFS would continue to work with these groups to find roads to facilitate their use, and although use areas may change, opportunities would still be available for these type events.

Closing roads would have a positive effect on non-motorized recreation experiences. The effect on hunting is determined by the perceptions of the hunter. Closing roads would improve wildlife habitat, which should improve the hunting experience, but hunters who prefer to drive or ride ATVs to their hunting site would find fewer opportunities.

3.8.2 Cumulative Effects on Recreation

Previous road improvements in the Project Area have decreased opportunities for non-motorized recreation, but increased opportunities for motorized recreation. Recent Forest Service emphasis on closing excess roads has had the opposite effect on both motorized and non-motorized recreation. Alternative C would have the largest effect on motorized opportunities, since it proposes more road closures. Under either action alternative, however, the cumulative effect on motorized recreation would be minimal because many roads would still be available for motorized recreation in nearly every part of the Project Area. As reflected in Table 4, there are currently 114.5 miles of road open year-long to vehicular use. Under Alternative B, there would be 93.0 miles of road open year-long, and under Alternative C there would be 80.1 miles of road open year-long. The cumulative effect on non-motorized recreation would continue to improve that experience.

3.9 Heritage Resources

This section summarizes the heritage specialist's report (located in the project file), which contains data, research references and detailed analysis of effects on the heritage

resource. Project design features and mitigation measures discussed in Chapter 2 are intended to ensure that the project meets Revised Forest Plan direction.

Cultural resource surveys have been completed for all areas that would be affected by this project under any of the analyzed alternatives. As a result of these surveys, 27 cultural resource properties have been evaluated as eligible or potentially eligible for nomination to the National Register of Historic Places (NRHP). An additional 66 cultural resource properties have been evaluated as not eligible for nomination to the NRHP. For the 27 eligible or potentially eligible cultural properties identified in the analysis area, 13 are located within or adjacent to proposed harvest units, fuel reduction areas, and/or transportation proposals. Specific mitigations measures for each site are identified in the Heritage Specialist Report.

The South Dakota Historic Preservation Office concurred on February 23, 2004 and May 10, 2004 with the determination that there would be no effect on heritage resources provided the identified mitigation measures are included in the project. The Forest would be in compliance with Section 106 of the National Historic Preservation Act under each alternative, for all proposed vegetation harvest, fuels treatments, and road proposals.

3.9.1 Cumulative Effects on Heritage Resources

Adverse cumulative effects to heritage resources on and around the National Forest result from the advances of time (such as weathering) and destruction through development, inadequate or inappropriate maintenance, or vandalism. As a result, the research value of heritage resources can disappear. The proposals being considered under this action have the potential to cumulatively impact heritage resources, but by avoiding or mitigating effects on all cultural properties, no cumulative impacts are expected to occur under any alternative.

3.10 Access and Travel Management

During public scoping, comments were received from several individuals expressing concern about the proposed closure of roads in the Project Area. The IDT considered the potential effects of each proposed road closure, and concluded that even with closure of the roads, sufficient access would remain in the Project Area. Adequate access for resource management and fire suppression would be retained under all alternatives.

As discussed under the recreation section, road closures would have a positive effect for those seeking a non-motorized recreation experience, but would reduce use of the area for motorized recreation. Some forest users may feel frustration at finding roads closed and may be displaced to other areas that are open to motorized travel. Alternative C proposes more road closures than Alternative B, and would represent the greatest change from the existing situation.

3.11 Economics

The focus of the economic analysis is the relationship between the costs and revenues provided by the set of proposed projects. A full socio-economic analysis discussing

market and non-market factors was conducted with the Forest Planning process and is not repeated here. Please refer to the Revised Forest Plan and Phase I amendment for further information.

Figures generated by economic efficiency analysis of timber projects are usually used as a means to compare alternatives (rather than as an absolute measure) because timber prices tend to fluctuate widely. For example, average sawtimber stumpage price in the Black Hills was $228.00 per thousand board feet in 1999. Currently (February 2004), the average price is $133.54 per thousand. There is no way to predict the probable price at which a future timber sale would sell, and actual economic efficiency of this project would depend on that factor.

Economic efficiency analysis of both action alternatives indicates that costs exceed revenue for both alternatives. Various costs and benefits were not included in this analysis. Some of these, such as recreational activities, take place across the National Forest and the Black Hills region. Recreation has an economic effect on local communities, but there is insufficient information to determine this specific project's contribution to this effect. Fuel reduction projects are costly in the short term, but the cost of a wildfire that may have been prevented by the fuel reduction could be exponentially higher but difficult to fully take into account in economic analysis. Other non-market factors, such as the value of habitat for rare species, are difficult to quantify and compare directly to commodities.

The economic efficiency analysis was generated using Quick Silver, a Forest Service economic analysis program customized for the Rocky Mountain Region and the BHNF. Present net value (the future benefit of the project discounted to the present) is negative $1,022,431 for Alternative B and negative $890,620 for Alternative C. Benefit/cost ratio is 0.48 for Alternative B and 0.49 for Alternative C, indicating costs would exceed revenues.

3.11.1 Cumulative Effects on Economics

The cumulative effects analysis area for economics includes the counties overlapping the National Forest (USDA 1996).

The Black Hills area economy was dominated by mining, timber harvest, and agriculture for many years. The region's economy is now well diversified (USDA 1996 p. III-473), but the future of some timber operators in the highly competitive forest products industry continues to be uncertain.

Both action alternatives would contribute to the local economy by producing forest products and employment and through procurement of services and products associated with project implementation.

4 INTERDISCIPLINARY TEAM

Brenda Shierts	Archeologist
Dave Atkins	Team Leader
Stephen Keegan	Scenery Management
Susan Corey	Botanist
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Terry Liddick	Wildlife Biologist
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Tom Smith	Range Specialist
Bonnie Jones	Lands and Recreation Specialist

5 GROUPS AND INDIVIDUALS CONTACTED

The following agencies, organizations, tribal governments, and individuals were contacted during preparation of this EA.

Biodiversity Conservation Alliance
South Dakota Chapter of the Sierra Club
Bureau of Land Management
Mary Flanderka
Nancy Hilding
Native Ecosystems Council
Pope & Talbot Inc.
Rocky Mountain Elk Foundation
Tom Troxel
Duane Becke
Meade County Commissioners
Lawrence County Commissioners
Senator Tim Johnson
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7 ACRONYM GUIDE

BA	Basal area
BMP	Best management practice
CAR	Commuity at risk
CCF	Hundred cubic feet
CFR	Code of Federal Regulations
CMAI	Culmination of mean annual increment
EA	Environmental assessment
FDR	Forest development road
FEIS	Final environmental impact statement
FH	Forest highway
FSH	Forest Service Handbook
FVS	Forest Vegetation Simulator
IDT	Interdisciplinary Team
MA	Management area
MBF	Thousand board feet
MIS	Management indicator species
MMBF	Million board feet
NFMA	National Forest Management Act
PFA	Post-fledging family area
POL	Products other than logs
R2	Region 2 (Rocky Mountain Region)
SS	(Habitat) structural stage
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
VSS	Vegetation Structural Stage
WUI	Wildland Urban Interface

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9 MONITORING PLAN – APPENDIX A

Action, effect, or resource	Method	Frequency of measure	Purpose	Responsible party
Biology				
Marten habitat	Track plate surveys	Annually	To assess marten presence	Wildlife biologist
Bat habitat	Hibernacula surveys of gated mines	Annually	To determine effectiveness of gates and population trends	Wildlife biologist
Goshawk use of Project Area	Field surveys during nesting and fledging seasons	Annually	To find any new or unknown nests that may need protection during proposed activities	Wildlife biologist
Goshawk nests	Field visits to each known active or historical nest during nesting season	Annually	To determine presence of breeding goshawks	Wildlife biologist
Big game and game fish species	Determined by State agency	Determined by State agency	To determine presence and population trends of game species across the Black Hills	South Dakota Department of Game, Fish and Parks
Aspen regeneration	Field surveys	One and five years after treatment	To determine effectiveness of regeneration and utilization by ungulates.	Wildlife biologist
Region 2 sensitive plants	Field surveys	Annually	To determine impacts from management actions	Forest botanist
Soil and Water				
Soil erosion on disturbed sites	Field surveys	One and three years after treatment	To assess effectiveness of mitigation and determine need for additional erosion control	Hydrologist

Transportation Management				
Road proposals	Field surveys	Ongoing after treatment	To determine effectiveness of road closures and impacts of 4X4 vehicles and ATVs. Determine need for additional measures.	Hydrologist, travel management specialist
Benner Gulch roads (NFSR road 231.2A and unclassified road RC 2X)	Field surveys	One year after treatment	To assess effectiveness of mitigation and determine need for additional measures.	Hydrologist, travel management specialist
Fire and Fuels				
Fuel treatments	Fuels inventory transects, fixed radius vegetation plots, digital photo points	Following treatment	To determine post-burn fuel loading and effectiveness of burn	Fuel specialist
Rehabilitation of fuels treatments	Field inspection	One and three years after treatment	To assess effectiveness of rehabilitation and determine need for further treatment	Fuels specialist, range specialist, weed specialist
Scenery				
Visual quality	Field review of visually sensitive areas	One year after treatment	To ensure visual quality objectives are met and assess effectiveness of mitigation	Landscape architect
Silviculture				
Hardwood dominance	Plot survey	Five years after treatment	To quantify amount of hardwoods and dominance	Wildlife biologist
Grassland cover	Walk-thru survey	Five years after treatment	To quantify amount of grassland	Wildlife biologist
Regeneration success, grass/forb structure, wildlife diverstiy	Plot survey	Five years after treatment	To quantify amount of grass/forb	Wildlife biologist, silviculturist
Sustainable commercial forest	Plot survey	Three and five years after treatment	To quantify regeneration success	Silviculturist

Snags, cavity nesting sites	Walk-thru survey	Five years after treatment	To determine effectiveness of prescription	Wildlife biologist, silviculturist
Vegetative diversity, fuel profile	Plot survey	Five years after treatment	To quantify resulting fuel loading and stand condition	Fuels specialist, silviculturist

10 PUBLIC COMMENTS ON DRAFT ENVIRONMENT ASSESSMENT – APPENDIX B

This appendix contains the public comments received by the Forest Service during the official 30-day comment period on the Draft Research-Rochford Environmental Assessment. The comment period began on March 24, 2004, and ended on April 23, 2004. Forest Service responses follow the comments.